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EDITORIAL NOTES.

The "New Day."

THE gas industry ought to be—we hope it is—extremely grateful to the British Commercial Gas Association for what it has done not only in connection with its own immediate and specific work, but in what it has silently but actively, if not with very definitive design, accomplished in spreading throughout the gas industry the new spirit of co-operation, which has made the way so much easier for the institution of the National Gas Council. Listening to the speeches at the meeting of the Association on Wednesday last—particularly those of the President (Sir Hallewell Rogers), the Chairman of the Executive Committee (Mr. F. W. Goodenough), the Chairman of the Society of British Gas Industries (Mr. H. M. Thornton), and Alderman Phillips—one could not but be struck with the fact that the gas industry is now operating under a new order of things, which new order is expressed and represented by the Association, and now in premier position and authority by the National Gas Council. Sir Hallewell spoke of a "New Day" for the gas industry, and of the industry being in a transition state at the present time. In a sense, perhaps, what is happening may be called a "transition state." But in our view it is merely a large natural development to which technical and commercial consideration is now being given, while the British Commercial Gas Association and the National Gas Council are the products of a greater wisdom, and of the recognition—a recognition that ought to have been made long since—that the industry could not hope to make the utmost progress by the continuance of a disjointed organization. The men of the industry have been willing enough at all times to inveigh against the inefficiency and the shortcomings of governmental bureaucracy; but they forgot to look at home to ascertain that the industry's organization was in worse case than the departmental conditions that exist in and about Whitehall. There were the entities representing sections of the industry. But there was no real headship; and, lacking headship, there was no real co-operation. There was occasional intercommunication; occasional allied action. But at the best the organizations were like different machines whose mechanisms, actions, and effects were all different. And, therefore, when they essayed to move as a common operative force, they frequently made a mess of the effort, lost time, and altogether things were unsatisfactory.

The first stage in the uniting of forces came through the British Commercial Gas Association; and this was a good piece of work accomplished. The industry owes much to this, and will owe still more. It marked the dawn of that "New Day" of which Sir Hallewell spoke. It agglomerated the separate units of the industry's organization for a limited but definite and important matter; and it did something more. Alderman Phillips alluded to the point last Wednesday. It drew valuable men out of local ruts. We have met some of these men—administrators, be it marked, of large gas undertakings—who only knew two or three gas men in their own immediate neighbourhood, and whose education in the gas industry's affairs was limited to the undertaking with which they were brought into contact. Beyond, all was to them nebulous. They knew nothing as to the large need there was for united action on matters of general policy, more especially in association with parliamentary affairs; they knew nothing of the need for joint action in connection with matters affecting the prosperity of the industry, in respect of the supply (for example) of materials, and in relation to prospective industrial developments. All their understanding of, and interest in, gas matters was concentrated in their own undertaking. But since then they have, through the Association, rubbed shoulders with gas administrators from elsewhere, with engineers, and with others engaged in the work of the industry, with the result that they have learned much more of the requirements not only of their own undertakings, but of the industry generally, owing to the broader and clearer view that they are able to take, and to a quickened comprehension of needs. Such enlarged understanding, knowledge, and comprehension are valuable not only to their undertakings, but to the entire industry. There was, indeed, as Alderman Phillips put it, the need, at the time of its inception, of such an organization as that of the British Commercial Gas Association. The need has revealed itself still more through the beneficent work of the Association—not only the educational and publicity work, but the work of reinforcement of the whole industry by bringing together its various sections, and the men of these sections.

And this good effect is being carried into the National Gas Council, which occupies in the industry's affairs a higher plane than its precursor in united effort—in fact, it occupies the highest plane of all in the industry's organization. There were several references to the new Council at the meeting of the British Commercial Gas Association; and it is quite evident that all are looking hopefully to it being of great assistance in the extended sphere that the industry is shaping itself to occupy. Sir Hallewell Rogers mentioned that the Executive Committee of the National Council are now engaged in designing a scheme of operation, in order to permit the new body to yield most efficient service to the industry, and through that service to render the industry itself more efficient for the larger work that confronts it. The Executive Committee are not going to produce at once the complete machinery that it is hoped the Council will ultimately deserve and possess. They are proceeding on the principle of feeling their way from comparatively small beginnings, in order that they may ascertain by experience precisely what is wanted in the way of powers and of equipment. We are glad to learn, in regard to the Executive Committee, that there is every indication that the power to co-opt is going to be exercised to the full; and there appears to be every probability that, while the Society of British Gas Industries will not at the present time be "of" the Executive Committee, it will be largely "with" that body. Although the Society has not a full co-partnership in the National Council through exclusion from the regular composition of the Executive Committee (which exclusion is not in accord with our notions of what should be), when we look back at the isolation in which the manufacturers stood at the time the Society of British Gas Industries came into being, there is gratification that, from the advent of the organization, they have advanced far along the road to the goal of complete representation and part in the general work of the industry, of which they are an important element. This general work has greater importance than hitherto, in view of the possible enlargement of the industry's interests and work in various directions. Into the "New Day," under the protection and by the aid of conjoint effort, the men of the industry are going forward "with stronger hope "and stronger determination to do still more useful work."

Calorific Power Applications and the Future.

THERE appears to be some fear abroad in the gas industry regarding the making of applications to the Board of Trade or the Local Government Board for the substitution of the calorific value standard for the illuminating power one under the new Gas (Standard of Calorific Power) Act. This, we think, has arisen through the talk among non-gas-supplying local authorities as to the Board of Trade putting upon companies a time-limit (say, during, and for a few months after, the war), and leaving the standard now fixed subject to revision at the end of that time. The point, too, has had prominence at the inquiries (called for by local authority opposition) already held into applications; and, although these inquiries have not all been reported, the features of the proceedings—especially those introduced by the opposing element—have been circulated. There ought,

therefore, to be some definite official pronouncement made on the subject, if harm is not to be done, and for very substantial reasons, although, from our own point of view and from what we understand, there is not the slightest occasion for any fear regarding time-limits or revision other than the revision to which parliamentary enactments are always exposed, providing conditions warrant (sometimes Justice takes a "wrong turning"), when a statutory concern is before Parliament with a fresh Bill or a Provisional Order. Parliament has fixed, as representing its present judgment, a standard of 540 B.Th.U. (total heat value), less 7½ per cent. before the penalty-line is reached, or 500 B.Th.U. without a margin. Exception has only been made by Parliament in the case of Liverpool and one or two others under special circumstances.

In the Sheffield inquiry [*ante*, p. 249], there was some attempt by the Corporation and others to obtain a standard of 550 B.Th.U., which was equivalent to the asking of a lower Court to, in a legal case, reject a decision of the Court of Appeal or the House of Lords. Mr. Garnham Roper, who conducted the inquiry on behalf of the Board of Trade, pointed out that they could not create precedents; and Parliament had not yet placed the limit at 550 B.Th.U.—that is to say, the recognized limit, which is as already stated. He also expressed the view that a standard of 500 B.Th.U. does not necessarily mean finality, and that it is quite possible Parliament might pass a General Act making it higher or lower. Parliament is not likely to pass an Act to raise the standard. That would be entirely opposed to the additional service that Parliament now asks of the gas industry, and which it is encouraging the industry to render to the nation after the war. But there was a question put by Mr. Roper to Counsel for the Corporation which, to some of the responsible men of the industry, has given rise to doubt. It is, "Would it meet the views of the parties if the Order "enabled either the Company or the Corporation to apply "to the Board of Trade after a certain period to reduce "or increase the standard?" The reply of Counsel for the Corporation was that they could not at all agree to a low standard being fixed now, with such a provision as the one suggested. The question by Mr. Roper suggests that something was in his mind in the nature of a *modus vivendi*; but his subsequent statement as to the Board of Trade not being in the position to create precedents antagonistic to those created by Parliament seems to indicate that there would be little value in a provision as to an appeal to the Board at a later date.

At the same time, the existence of the fear that the now prescribed standard may be but a temporary matter, merely to serve the Government as a useful expedient at this time, should be set finally and firmly at rest by the Board of Trade and the Ministry of Munitions. It is doing no good. Gas undertakings are asked to erect plant for the oil-washing of their gas for the extraction of benzol and toluol; and this means, too, additional plant for the distillation of the oil, in order to recover the benzol and toluol. In doing this, they are not in many cases deriving any immediate direct advantage; they are patriotically carrying on the process; and at the same time they are doing it under a positive incentive contained in a circular-letter sent out, in the name of Lord Moulton, by the Ministry of Munitions early in July last. This letter urged gas undertakings to instal benzol-recovery plants, and requested immediate notification of the decision come to in the matter. It also stated that the experience gained in the working of these plants has removed the apprehension that the extraction of the crude benzol from the gas would, by deteriorating the quality of the latter, inconvenience consumers, and, furthermore, that it has been established that the revenue produced by such plants makes their installation a fair commercial proposition. In the same letter, there was reference to the Bill [now the Act] that had been introduced into Parliament to facilitate the transfer from an illuminating power to a calorific value standard in the case of those undertakings which have erected suitable benzol plants, and thus, it was said, "the usefulness of these plants would not be "limited to the duration of the war." In the circular-letter, there is, to all intents and purposes, the promise of protection after the war by a continuance of the conditions now set up in relation to a standard. If there is any prospect of the conditions being interfered with after a time at the instance of local authorities, then the usefulness of the plant might be very much limited—indeed, if the erroneous views of some local authorities were upheld, the plant might be made entirely inoperative. We suggest that any imposition of a time-limit would be wholly incompatible with the letter from the Ministry of Munitions, and it is only just that the Departments concerned in the making of Orders for the substitution of the one standard for the other should respect both the spirit and the letter of the communication, on the faith of which much has already been done.

For the benefit of the country in this war, the gas industry is largely altering its practices on a definite basis—a basis in which the calorific standard now prescribed has part; and it would be totally unjust to the gas undertakings which have done and which are doing this if, within a short period, they are, owing to the extravagant notions of local authorities, to have the basis upset by an upward change in the numerical condition of their calorific standard. A higher standard would be disadvantageous to the use of the plants that have been and are being put up, as well as to greater *post*-war service to other industries of the country. It would be opposed, too, to the endeavour to produce from the coal a greater value, in order that a cheaper fuel gas may be supplied. There will be quite sufficient difficulties to contend with after the war—in the higher costs of capital, materials, and labour—without having the uncertainty suspended over undertakings of a higher standard being required. We urge the authorities to give a clear assurance now that there is safety from any such contingency; the want of such an assurance is doing no good.

Gas Engineers—Past and Present.

Men specializing in other branches of engineering and industry do not know so much as they should do of the history, present position, and prospects of the gas industry—technically and commercially; and there are few men now with us who can equally with Mr. H. E. Jones enlighten them, from personal experience, as to the men and the conditions of the industry in distant past years, and yet can also speak of the present and the prospects of the industry with the enthusiasm of a much younger man keenly alive to its potentialities. Mr. Jones had the honour of delivering the "Thomas Hawksley Lecture" to the members of the Institution of Mechanical Engineers last Friday night; and he chose for his theme the gas engineers of the past century. Through the premises of the "Mechanicals" being devoted to national purposes, the lecture was delivered in the new lecture theatre of the Institution of Civil Engineers. Had the old building of the latter still been in existence, it would have been a more appropriate scene for the lecture, as many of the men who have had conspicuous part in constructing the fabric of the gas industry during some years away in the last century were frequently to be found there sitting in the light of, or away in the shadows cast by, the then forms of gas lighting, before the advent of incandescent gas and electric lighting. But it was in the new theatre that their names and their work were to be brought into prominence, thus helping to show the process of evolution in many directions that has brought the gas industry to its present magnitude. The evolution has covered a large area; and anyway within the last thirty years, the development has been simultaneous along the lines of engineering, technical process, and application of the primary product, while the secondary products have likewise contributed to the increase, and hold within them the promise of doing so to the still greater advantage of the industry. It was a magnificent record of which there was presentment in the lecture.

And about the record there is one thing of which the gas engineers present and future must never lose sight. It is the debt of gratitude that they owe to the gas engineers who laboured in the early, the mid, and later years of last century. They were men of great courage, of great ability, and of great perseverance. Those in the forepart of the century had nothing before them but undeveloped territory; they were original explorers, and there was little to guide them. They laboured under the severest limitations. There were in those days no contractors who specialized in gas plant or appliances; and the transport of materials was bad relatively with to-day. The engineer had to design and seek improvement; every detail was his care; and close supervision over contractors and their men claimed more time than is necessary to-day. There is much indebtedness to those engineers. From the inchoate stage, the industry has grown to a highly technical one, but rendering increasingly efficient service on the simplest of lines, and still the prospect is large, all which points to the soundness of the foun-

dations, and of the course of development. Never, indeed, were the opportunities greater than now for gas engineers, for they have to help them the garnered experience, knowledge, and development of upwards of a century, with fresh service of an important character breaking out here and there. All the knowledge and all the incentive that are the possessions of to-day, the early gas engineers had not, and yet they pressed forward. Their example is a worthy one. The gas engineer of the present time honours them by giving of his best, even as they did under circumstances incomparable in favour.

What, asks Mr. Jones, is the special task that is before the gas engineer of to-day? He expresses his own views by putting a second question. Is it not to find a gaseous fuel superior to producer gas, and therefore worth distributing, and yet cheaper than the gas which is now supplied, because the valuable residuals should all be recovered to the last ounce? In this question there is no living in the past, no stunted conservatism, no obsession by the practices of a long professional career, with its great and varied circumstances. There is in it a looking forward with open mind and open eyes as to the prospects, requirements, and opportunities. There is talk of fuel economy, of the production from our coal resources of all the value occluded therein, of greater atmospheric sanitation through the elimination of smoke pollution, of labour reduction by increasing the conveniences of the community. The carbonization of coal and gas on tap are the means to these ends, which are destined to produce economic advantage for the community collectively, and for every individual unit of it. It is a big purpose that should be animating the gas industry, and it is a large opportunity that offers. Let us here quote Mr. Jones again: "Can we not establish the real value of our coke, "improve the output of ammonia, seek to bring into ac- "count all the numerous family of hydrocarbons that is re- "sident in the tar, such as fill so many practical uses in the "arts—realizing a cost of production, with improved labour- "saving appliances, which will enable us to supply power "and heat for all purposes, trade and domestic, at charges "which would make it worth no one's while to employ any "other sort of fuel, especially looking to the facility of ob- "taining it unlimited at will afforded by a constant supply "from the street mains." In these words are expressed duty and responsibility for the gas engineer of the present. The pioneer gas engineers did not wait for "something to turn "up." They worked zealously on crude conditions with the view to the development of good service. Let the gas engineers of to-day emulate their example, knowing what is wanted, and the opportunity that their peculiar and established position offers.

Tar Washing of Gas—An Old German Proposal.

THE inquiry has been privately put to us more than once whether there is anything really new in the washing of gas by tar for the recovery of benzol and toluol, and whether there was any reason for all the secrecy with which the incorporation in gas-works practice of the process was enshrouded for quite a long time. Some engineers spoke with bated breath of the process as if the mention of the washing of gas by tar would have been divulging to the enemy some important State secret. It was always a mystery to us—knowing that the tar washing of gas had been tried in Germany—why there should have been such an attempt at studious concealment of something that was already known. The enemy knew well enough that we must have benzol and toluol for explosives making; the enemy knew that the process of increasing the supply was by washing coal gas by oil or tar; and the enemy unquestionably knew, too, that coal gas was made at gas-works and coke-oven plants. But there must be a care. The enemy must not be informed of those things of which he was already aware. If there is any doubt as to his knowledge, the reproduction, in another column, of a specification of a patent taken out in this country by two residents in Germany—Fritz Friedländer and Julius Quaglio—will set the matter at rest. It will be seen that they proposed to remove from coal gas a portion of the benzol and toluol content by washing the gas with a thin liquid tar in a gas washer or scrubber. That is the whole system without the working details—temperatures and otherwise. This invention went through the British Patent Office only five months short of thirty years ago! Of course, we can well understand that there is no need to tell the enemy exactly where benzol and toluol plants are situated, nor give particulars as to their capacity, nor details as to their degree of efficiency. But the secrecy over the application of tar to the washing of gas! We can hear the teutonic guffaw across the North sea.

Manufacturers and Overseas Trade.

In view of the discussion on matters pertaining to the problem of post war trade, it may not be amiss to direct attention to the fact that the Department of Commercial Intelligence are inviting applications from manufacturers and exporters of United Kingdom goods who are desirous of extending their trade in markets abroad. It is felt to be generally desirable that those who wish for information of the character indicated should apply in the first instance to the Department, at No. 73, Basinghall Street, inasmuch as, when the particulars asked for are already in their possession, this course will clearly avoid much delay. In addition to specifying the countries regarding which information is desired, applicants would doubtless find it to their advantage to set forth precisely the kind of goods about which inquiry is being made, and the particular points with regard to which information is wanted.

A Gas-Works Purchase by Agreement.

The negotiations between the parties for an agreement as to price, which were the cause of the adjournment last month of the Chelmsford Gas-Works purchase arbitration, have had a successful issue; and at a special meeting of the Town Council a week ago, the announcement was made that a provisional agreement [which was subsequently unanimously adopted by the Council] had been entered into between the Parliamentary Committee and the Chelmsford Gas Company for the acquisition of the works. The present capital of the Company is £72,650; while there are debentures amounting to £10,500—making a total of £83,150. The purchase price fixed is £104 per £100 of stock, which, including the debentures, gives a total of £86,056. It was pointed out by the Mayor that the quantity of gas sold by the Company last year was over 102 million cubic feet, which makes the agreed price about £845 per million feet. In this figure the question of compensation to officers has not been considered; and, further, the Corporation will pay the Company's taxed costs incurred in preparing for the arbitration. The works will be taken over by the Corporation at the end of three months; and they will pay the Company interest at the rate of 5 per cent. per annum upon the unpaid purchase money until the consent of the Treasury to borrow the money is obtained, or until the clause in the Corporation's Act restricting borrowing of money during the continuance of the war and for twelve months afterwards becomes inoperative by the effluxion of time.

Friendlessness of Low-Temperature Carbonization.

There seems little hope of low-temperature carbonization establishing itself as a commercial enterprise—at any rate, for some time to come, if at all. It cannot get on without a good deal of assistance. Gas-works have no particular wish to go back to low-temperatures, and handle a considerably greater quantity of raw material than is requisite at the present time under the high-temperature process; and if after the war they have any difficulty in getting rid of their coke, then in industrial areas they might consider whether anything can be done to gasify a portion of it in ammonia-recovery gas-producers, and sell the gas to local manufacturers. This might give them a larger power of competition with the electric-motor. Gas-works, too, are not prepared to take the gas yield of low-temperature plants unless at a price that would pay them better than their own methods do at the present time. Finding that gas undertakings had no use for either low-temperature processes or the gas produced from such plants, those interested in them turned to the colliery owners. These again either do not wish to be worried with the process, or they have coke-ovens in operation, and have no inclination to saddle themselves with a second carbonizing process. The difficulties of the Barnsley Fuel Company, and the loss of further patronage from the Government, have given an additional setback to any prospects that the Coalite Company fondly thought they possessed a few months ago. Now the Company are trying to cultivate an alliance with electrical engineers as fuel suppliers in the gaseous form; and they have set their eyes on Brighton. But there were fears among the local councillors; and the final

decision has yet to be learned. Lest we touch the susceptibilities of some of our friends, the remark should be made that all low-temperature processes are not the same either in working or results.

A Poor Commercial Outlook.

The writer of "Notes on Bye-Product Coking" in the "Iron and Coal Trades Review" is unable to detect any practical advantages in any low-temperature process for either gas-works or colliery people—in fact, he sees it at a commercial disadvantage, owing to the low price realized for the gas made by the process *per se*, without taking into calculation producer gas which can also be obtained from gas-works coke or low-grade coal, with ammonia recovery. Unless people with works adjoining low-temperature plants are prepared to buy gas from the owners, the latter will have no settled business, and the whole of the other products—from coke onwards—will be subject to market vicissitudes. With a low price obtainable for gas, the writer in the "Review" says that the difference between what is realized for gas by a gas undertaking and the amount that is realized for gas produced by a low-temperature plant must be piled on to the other products from the latter. But it is questionable whether for coke with a small additional percentage of volatile matter in it than there is in high-temperature coke, the public will be prepared to pay more than, or as much as, is paid in normal times for coal. Metallurgical oven coke, too, has greater value than low-temperature coke, which is practically worthless for industrial operations. As to sulphate of ammonia, this, from the market value point of view, has also indefinite prospects; and there is some loss of ammonia in the process, unless a gas producer plant (with ammonia recovery) is attached, and the major part of the ammonia resident in the coke is rescued.

Revenue Production.

However, the writer in our coal contemporary is persuaded a low-temperature process cannot compete in revenue per ton of coal carbonized with either gas-works or coke-oven processes. The idea of fastening on to the low-temperature system a gas-producer plant is merely intended to give the former a better financial complexion. Among the statements of the "Review" writer is that in gas-works operations, the revenue per ton of coal is derived approximately in the following proportions: From the coke, three-eighths; from the gas, one-half; from the bye-products, one-eighth. On a coke-oven plant the proportions may be taken as: Coke, four-fifths; gas, one thirty-fifth; bye-products, six thirty-fifths—the proportion for gas being almost negligible. We are sorry to have to disagree with the writer; for his proportions for gas-works must not be taken as even approximate. Picking indiscriminately from a bundle of gas company accounts, one for a well-know concern, it is seen that one year—a pre-war one—the gas (with meter, stove, and fire rentals) produced six-eighths of the revenue, or gas, without the rents, eleven-sixteenths; the coke a little under three-sixteenths; the other products rather more than one-sixteenth.

Problems of Reduced Lighting.

For partially obscuring lights from street-lamps, says "The Times" Engineering Supplement, nothing, perhaps, is better or more economical than a good washable distemper, green being the best colour, as it possesses considerable "body" or opacity. Many varieties of washable distempers are on the market; and it is important to choose a brand which is specially made for outside use—preferably one which requires the addition of petrifying liquid. The best plan is to apply with a brush the paint as thick as it can be mixed, and then stippie it—*i.e.*, dab the surface over while wet with the point of a brush. This will give a uniform mottled effect. For painting kerbs and posts so that they may be visible on dark nights, the same class of distemper, white in colour, is probably the best material; but it is somewhat expensive. Some municipalities have employed ordinary whitewash, which, however, is not economical, because, unless it is specially prepared, it quickly washes off with the rain. The following is an old but very good recipe for making a wash which will withstand the weather. It answers equally well on wood, brick, iron, or stone, and while nearly as durable as oil paint is much cheaper. Slake one bushel of ordinary stone lime with boiling water, keeping it covered during the process. Strain it, and add two pecks of salt dissolved in warm water, 6 lbs. of ground rice put in boiling water and boiled to a thin paste, 1 lb. of boiled Spanish whiting, and 2 lbs. of first-class glue or gelatine dissolved in hot water. The ingredients should be thoroughly amalgamated, and the mixture allowed to stand for several days before using. It should be kept in a kettle or portable furnace, and applied hot.

PERSONAL.

HENRY RAYNER.

In connection with the brief intimation which appeared in last week's "Journal," to the effect that Mr. W. Beckford Long had been appointed Secretary of the Gas Light and Coke Company in succession to Mr. Henry Rayner, we regret to say that Mr. Rayner's retirement was due in the first place to a sudden and severe heart attack some six months ago, which involved (on medical advice) a long spell of rest. The result has been so beneficial as perhaps to justify him in attempting to resume his duties; but unhappily he has recently suffered the loss of a very dear son, whose promising career was ended by a fatal attack of enteric while on active service in Mesopotamia. This combination of circumstances naturally rather overwhelmed Mr. Rayner, and led him to apply to the Directors for permission to anticipate, by some two years, the date at which under normal conditions he would in any case have retired. To this, they kindly consented, with much other evidence of their goodwill.

Thus has been brought to a close a period of service with the Company extending over no less than 42 years. Beginning as a junior clerk in the rental department, Mr. Rayner was transferred two years later (at the time of the Imperial amalgamation) to the Secretary's office, where he had the advantage of working under the late Mr. J. Orwell Phillips, of whom he speaks as the greatest of chiefs and the best of friends. At that time (about 1876), Mr. Frank Bush became Assistant Secretary; and again Mr. Rayner counts himself lucky in having for a number of years worked under his guidance and friendship. Mr. Rayner was appointed Assistant Secretary in 1901, upon the retirement from that post of Mr. Joseph Reeson (still happily living, and in good health), and succeeded to the Secretaryship in 1903, when the dual office of Secretary and General Manager was vacated by Mr. John W. Field and Mr. D. Milne Watson became General Manager. A more helpful and delightful colleague, declares Mr. Rayner, one could not imagine.

Over so long a time, Mr. Rayner has, of course, seen many changes. His period of service covers amalgamations with six other gas companies, the reign of four different Governors, and the elimination by degrees of practically two Boards of Directors. To him, as to all the old officers, the present-day prosperity of the Company is a source of intense gratification; and much of this prosperity is, in his opinion, due to the loyalty, unanimity, and goodfellowship which have characterized the staff under the altered *régime* of late years. As for Mr. Rayner's personal record, it is one of years of hard work conscientiously performed, and, he feels, amply rewarded. He has never sought to identify himself to any extent with public gas matters—owing partly perhaps to some lack of inclination, but in a still greater measure to lack of time.

Mr. F. J. Bywater, the Engineer of the South Metropolitan Gas Company's East Greenwich works, who on the outbreak of war joined the Royal Engineers, has recently been gazetted Lieutenant-Colonel.

Mr. James Braddock, the Manager and Secretary of the Radcliffe and Pilkington Gas Company, Radcliffe, has resigned that position after 35 years' service, and is retained by the Company for consultation and other purposes. His son, Mr. Robert B. Braddock, for many years the assistant, has been appointed Manager and Secretary.

An interesting gathering took place at Nottingham last Friday evening, when, in commemoration of his completion of fifty years' official connection with the Corporation, Mr. J. H. Richards, the Deputy Town Clerk, was presented with a silver salver and a war loan bond for £125. Mr. Richards has been associated with the city's affairs during the period of Nottingham's greatest expansion. He has served under four Town Clerks, and been responsible for much important work in connection with the gas and water as well as other departments of corporate activity.

OBITUARY.

Mr. Henry Watson Mead, for the last thirteen years Chairman of the Westbury Gas and Coke Company, Wilts, died on Wednesday last. He had been a member of the Board for about thirty years.

We regret to learn of the death in Birmingham last Thursday, from heart failure following influenza, of Mrs. Emily Cooke, widow of the late Mr. Adam Cooke, Engineer and Manager of the Oldbury Gas-Works (who died just over two years ago), and mother of Mr. A. D. Cooke, Assistant Engineer at the Smethwick Gas-Works. Mrs. Cooke had never really got over the shock of her husband's death; the couple were all in all to each other.

The funeral of Mr. J. G. Newbigging took place at the Manchester Crematorium last Wednesday; the officiating minister being the Rev. P. K. Batchan, of the Congregational Church, Heaton Moor. The principal mourners were: Mrs. Newbigging, Lieutenant John Newbigging, and Mr. William Newbigging. The following members of the Manchester Corporation Gas Committee were also present: Alderman Kay (Chairman), Aldermen Ashton, Birkbeck, Bowes, Smith, and Watmough, and Councillors Chapman, Chesters, Cook, Davy, Harrison, Lecomber, and Pine.

Alderman Hassall (the Deputy-Chairman of the Committee) was unable to be present owing to illness. The officials of the Department who attended were: Mr. F. A. Price (Superintendent), Mr. F. P. Smith (Accountant), Mr. J. R. Brocklebank (Superintendent of the Street Mains and Lighting Department), Mr. F. Arnott, Mr. G. W. Tooley, Mr. J. R. Hill, and Mr. W. Buckley (Managers of the respective gas-works), and Messrs. C. H. Bradbury, W. H. Cummins, A. L. Holton, E. Williams, E. W. S. Parker, and J. Edmondson. Officials of other departments were also present, as well as members of the Manchester District Institution of Gas Engineers and the Institution of Civil Engineers.

LIFE OF GAS-METERS RESEARCH.

Up to the present, the Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries who are proceeding with an investigation into the various conditions affecting the life of gas-meters, have confined their inquiry to the chemical aspects involved. It is, however, now proposed to obtain some statistics of working results; and to this end a circular is being sent to all gas undertakings by Mr. Walter T. Dunn, the Secretary of the Institution, containing a list of questions, replies to which, so far as the recipients may possess statistics, are desired. It is not intended to publish the names of the undertakings furnishing the information.

The particulars asked for are in connection with the number of meters in use; the reasons for using wet or dry meters; whether they are removed at regular intervals for test, or are allowed to run indefinitely without internal examination so long as they seem to work satisfactorily; the results of tests; the accuracy of registration of meters after various periods of service on the district when fixed in different positions; the time meters are allowed to remain in unoccupied premises or on consumers' premises though not in use; the precautions taken to exclude air from those not in use; the protection afforded to stored meters; the maximum consumption per hour allowed for in fixing meters; and the practice for determining the size required for use with gas-engines and slot installations with cookers.

CALORIFIC STANDARD ACT APPLICATIONS.

Ninth Official List.

The Local Government Board announce that they have received the following applications from Local Authorities for Orders under the Gas (Standard of Calorific Power) Act, 1916. The proposed standard is 500 B.Th.U.

Bingley Urban District Council.
Blackpool Town Council.

The Board of Trade have also received the following further applications for Orders from the under-mentioned Companies; the calorific power mentioned being 500 B.Th.U. in each case, except that of the South Suburban Company, who propose 475 B.Th.U.

Barnet District Gas and Water Company.
Cardiff Gas Light and Coke Company.
North Middlesex Gas Company.
Rushden and Higham Ferrers District Gas Company.
South Suburban Gas Company.
Walton-on-Thames and Weybridge Gas Company.

Dehydration of Tar.

The distillation of tar being now organized in France in accordance with an order prescribing its delivery to the distillers with not more than 4 per cent. of water, M. Mallet (in the "Journal des Unines à Gaz" of Oct. 20) has published some recommendations to gas makers, drawn up at the suggestion of the Société Technique. He remarks that some fourteen years ago, at Marseilles, tar was dehydrated in a Hignette centrifugal plant, by which the water was easily reduced to 1 per cent., with a production of 6400 kilos (6¼ tons) per day. While this is the most perfect process for the purpose, it is not within the power of many works—decantation methods, depending on differences of density, are alone possible. In adopting this method, it is pointed out that hot tar, containing free carbon, if cooled in the presence of water, absorbs a considerable quantity of the latter in the form of an emulsion and causes difficulty in its subsequent separation. Thus, as far as possible, supernatant water should be separated at the outlet of the hydraulic main, and run off by a separate system of pipes from that along which the tar passes and thereby cools. Tar pumped from tanks may be conveyed into a raised receptacle of a capacity considerably greater than one railway tank, and provided with a steam coil in its base, by which the tar is heated to 100° or 120° Fahr. Here 48 hours will produce a satisfactory result as regards dehydration. In filling the railway tank from the intermediate receptacle, at least a 3 feet depth of tar should remain in the latter after discharging. The pipe delivering tar from the pump should lead direct to the floor of the receptacle, in order to avoid the emulsification of the tar in its passage with supernatant water, which latter should be returned to the main tanks by an overflow.

THE GAS ENGINEER OF THE LAST CENTURY.

Mr. H. E. Jones Delivers the "Thomas Hawksley Lecture."

The Institution of Mechanical Engineers were the tenants of the Lecture Theatre of the Institution of Civil Engineers last Friday evening; their own (almost adjacent) splendid premises being at the present time occupied for purposes connected with the war. The occasion was the delivery by Mr. H. E. Jones, M.Inst.C.E., of the Thomas Hawksley Lecture; and despite the uninviting conditions of weather and streets, there was a large attendance of members and friends to hear Mr. Jones's historical review. He took for his subject "The Gas Engineer of the Last Century;" and he showed that there were more than one, and that they were men of great courage and ability, who had to work under conditions that were not contributory to ease or success. But success they achieved. Before the lecture concluded, those present had been given a good insight into the careers and duties of a gas engineer of Mr. Hawksley's day and of those of the present. Like all the early engineers, Mr. Hawksley was a general practitioner; and he practised extensively not only in connection with water supply and sanitation, but in the installation of gas supply—then mainly for lighting only.

Responsibilities and Difficulties of the Early Gas Engineer.

We proceeded to hear of the responsibilities and difficulties of the gas engineer in the early part of the Nineteenth Century, when little was known of the necessary requirements in plant and the methods of applying them, and practically nothing of its special operations for purifying. Contractors did not exist for specialities as they do to-day; and the engineer had to furnish drawings, specifications, and workshop instructions in the fullest detail. Instructions had to be carried to a degree beyond the understanding of engineers and contractors of the present time, who have had all the benefit of their predecessors' experience for the three generations which have passed. But the lecturer guarded himself against being understood to suggest that essential elements in design and execution are even now to be in any degree passed over by the engineer. But in those early times, the gas engineer had to himself ensure, by close supervision, how the work was to be done in detail by the contractors' artizans.

The Early Days of Gas Lighting—And Progress.

From this attention was transferred to the inception and the nascent period of gas supply. We heard of Clayton, Watson, Murdoch, Lebon, and Winsor; of the parliamentary schemes of 1809-14, from which issued the National Light and Heat Company, afterwards the Chartered Company, and now the Gas Light and Coke Company; of the lighting of the streets of London and Paris; and of how Winsor's schemes prospered in the hands of Clegg, Mabon, and other prominent engineers. From Peckston's account of the Chartered Gas Company and other sources of information, particulars were given as to the pioneer London companies and the works built to supply London. Between 1837 and 1915, the consumption of gas in London grew from 1600 million cubic feet to 42,624 million cubic feet; and the average price was reduced from 6s. to 2s. 8d. Between 1889 and 1915, the number of consumers per mile of main grew from 105 to 306; and the sale of gas per mile of main from 8,906,000 to 10,050,000 cubic feet in the same period. As to the progress throughout the country at large, beyond the list published in the "Journal of Gas Lighting" in the early years of its issue (1849-50), in which there were no fewer than 750 established gas companies in the kingdom, there are no records available of the general position before 1880, when the Board of Trade collected returns and published them. In the 35 years since, the capital of the statutory undertakings has increased 224 per cent., the coal used 170 per cent., the gas consumed 300 per cent., and the number of consumers 500 per cent. Between 1890 and 1914, the extent of mains was only increased by 80 per cent.—viz., 21,970 to 39,100 miles. The sale of gas per mile of main rose in the 24 years from 4·3 millions to 5·4 millions; while the average per consumer fell from 41,000 to 23,000 cubic feet, due to the incoming of the prepayment consumer.

Plant Development.

This is excellent progress, and naturally those present expected to hear—and they were not disappointed—of considerable improvements in plant and processes. They were told of diminutive gasholders and primitive methods; and the former were contrasted with Sir George Livesey's 12 million cubic feet holder, Mr. Charles Hunt's 8 million holder, and then the Manchester 10 million one, which impress one with the magnitude of the development of the last half century. The names of Hedley of Dublin, Fraser in Scotland, and Grafton in England were introduced here; the two latter being responsible for the change from iron to clay retorts, which, however, were not generally used until 1840. There was a dip at this point into "Clegg's Treatise." So late as 1864, iron retorts were used by Croll and George Anderson in settings where the primary hot gases of the furnace were directed to clay retorts set above the iron ones; and these were drawn when reduced in temperature round the iron retorts below. The system claimed specially to save fuel, and was successfully worked for many years both at the Surrey Consumers' and the Great Central works. Fraser in Scotland, John Eunson, and Robert

Jones, in the forties and fifties, did much to establish the durability and the superior efficiency of carbonizing in clay retorts; while both Croll and Geo. Anderson were persistent advocates of their value from 1845 onwards. The important changes effected in heating retorts since Siemens's reverberatory furnace for smelting was introduced were mentioned; and credit was accorded to Hunt and Hislop for "the early steps leading to the present success, which gives great control of temperature as well as saving of fuel." Pictured next were the changes from hand labour in stoking to machine operation. Morton, Arrol and Foulis ("for low wear and tear and steady action, the Arrol-Foulis machines are not easy to beat to-day"), West (whose machines are working to-day with the greatest efficiency), De Brouwer, and Fiddes and Aldridge had their names brought into prominence as contributors to development in this connection.

Allusion was made by the lecturer to the efforts to produce a better coke by carbonizing coal in ovens on lines approaching those of the coke plants at collieries. These are not new ideas, as the old London Gas Company had, within the memory of Mr. Jones in 1854, ovens for making gas and coke on a principle such as is now suggested, and indeed is in use in Birmingham. They were introduced by M. Michele. But they were ruinously inefficient, chiefly through bad construction; and the Company were working without a profit until, on the death of Michele, they consulted the late Mr. Robert Jones, who replaced the ovens by clay retorts. The Company were but a few years afterwards paying 10 per cent. The Coze inclined retorts were mentioned; and then the Woodall-Duckham vertical ones—the others of the same family had to be content with inclusion in the phrase: "There are a great many modifications of the system being introduced, and they are favourably reputed."

The mention of condensers introduced the names of Malam, Lowe, Kirkham, Marten, and Alexander Wright. Purification brought to the fore the work of Mr. John Birch Paddon in connection with ammonia recovery. Croll also took out a patent for ammonia removal by chloride of manganese; but this was less effective than washing and scrubbing by water. Lime and oxide purification had their place in the record; and the economy and efficiency to be gained by the provision of ample purifier space was pointed out.

Explanation was next given regarding the change in structural details of gasholder tanks and the holders themselves, and of the considerable economy in first cost that there has been per 1000 cubic feet of capacity. "The whole work of tank and gasholder complete has been effected on a scale of 3 millions at a cost of a little over £5 per 1000 cubic feet, whereas the gasholders of early days were known to have cost from £40 to £50 per 1000 cubic feet." As to distribution, cast-iron pipes were reported in Clegg's period to be costing some £14 per ton, being of cold blast iron. As showing the greater perfection of the modern system of main-laying, the higher pressures now employed are not found to increase the leakage. The advances made in distribution pressures have also brought the smaller rural areas within the compass of gas supply from the larger undertakings.

Gas Engineers of Note.

Passing over the section of the lecture devoted to carburetted water gas, brief biographies were given of gas engineers of special note—viz., Winsor, Clegg, Malam, Mabon, Sadler (who preceded at Liverpool William King, uncle of the late Alfred King and grand uncle of the present William King), Peckston, John Evans, George Lowe, Kirkham, Methven, Eunson, Goddard, Robinson, Bartholomew, Foulis, Reid (of Edinburgh, which reference introduced the Granton works and the name of W. R. Herring), F. J. Evans, V. Wyatt, Geo. Evans, Robert Jones, Alexander Wright, and A. A. Croll. Then with closer connection with the present were named: Thomas Newbigging, J. B. Paddon, G. W. Stevenson, Jabez Church, Thomas N. Kirkham, Robert Morton, T. G. Barlow (formerly Editor of the "Journal"), Thomas Hawksley, G. C. Trewby, Sir Corbet Woodall, and Sir George Livesey.

Thomas Hawksley.

But for extent and magnitude of practice in gas-works construction, carried out from 1830 to 1893, Mr. Thomas Hawksley could not be equalled by any engineer at any date, within the Nineteenth Century or since. This is obvious from a recital of the works he built for towns he originally supplied with gas; and apart from the extensive consulting practice on works construction and parliamentary and arbitration proceedings. And if it be remembered that his practice was chiefly in water-works on an extensive scale, in the course of which he brought water into no less than 150 towns in England and abroad, it will be clearly seen that his work was simply prodigious in extent and variety. To illustrate this, the lecturer appealed to the list of gas-works designed, either in whole or in part, by Thomas Hawksley, and carried out under his direction.

Great Britain: Nottingham, Sunderland, Derby, Cambridge, Oxford, Burton-on-Trent, Folkestone, Radcliffe, Chesterfield, Mansfield, Barnsley, Gosport, Bishop Auckland, Newark-on-Trent, King's Lynn, Normanton, Victoria Docks, Lowestoft.

Foreign Countries and Colonies: Melbourne, Bombay, Hobart (Tasmania), Launceston (Tasmania), and Copenhagen (Danish Gas Company).

Seeing that Thomas Hawksley had, in the early days, very little assistance from contractors with experienced or skilled labour, foundries, rolling-mills, or machine tools, and therefore had largely to teach his various contractors in all the specialities, such as retort-setting, gasholder and tank construction, as well as in purification plant and largely in steam plant, his labours must have been such as would have overpowered anyone with a weaker physique and less vital energy. An examination of his earlier works shows that they were of Roman endurance, and had a strength of material that to-day is not found necessary. It, however, had the merit of an endurance which made the old plant valuable and serviceable when replaced to work in fresh situations. Mr. Hawksley shone when advising parliamentary committees. He was sympathetic with the difficulties of young engineers, and freely helped them with technical advice. He was President and Member of the Council of the Institution of Civil Engineers; he was President of the Institution of Mechanical Engineers for two years and a Member of the Council; he was first President of the British Association of Gas Managers. His extraordinarily useful and successful career makes him an exemplary figure for the followers of his profession. He must certainly be considered an important pioneer in the history of gas engineering during the last century.

Sir George Livesey.

There is no other such striking personality in the history of gas engineering until we come to the late Sir George Livesey, who was very like Mr. Hawksley in the personal qualities of courage, originality, and resource in difficulties, strong in will, fixed in purpose, and, like him, too, kindly, helpful, and considerate to the point of gentleness where sympathy came in. Glimpses were given by the lecturer of the originality of Sir George in his engineering work, and of the part he played in directing the policy and financial aspects of gas supply. The sliding-scale, the introduction of co-partnership into gas supply, his work as an administrator, his parliamentary battles for greater freedom for the gas industry supplied his old friend, the lecturer, with passages that were not the least in point of interest among all else—number of men and mass of incident—of which the lecture was composed. The source of Sir George's influence was his obvious sincerity and earnest purpose. In connection with the changes in the industry, the work of Mr. Charles Carpenter, D.Sc., in devising the "Metropolitan" No. 2 standard burner and in other directions was mentioned.

Services of the Industry—The Present Problem.

In the concluding part of the lecture, more information was given as to the expansion of the services of the industry—from domestic to industrial. In the case of the Wandsworth, Wimbledon, and Epsom Gas Company, 40,000 slot meter users consume in the summer six months 10,207 cubic feet of gas each, against the consumption in the winter six months of 11,026 cubic feet each, or within 8 per cent. of the same quantity in summer as in winter. The highest peak of the demand is between mid-day and 1 p.m. on a summer Sunday. It is interesting to learn that H.M. Mint and Messrs. Rothschild's refineries consume respectively for furnace work as much gas as towns of 10,000 inhabitants. To-day the industry is also very busy on war service. Drawing towards the close of the lecture, Mr. Jones asked: What task is before the gas engineers of to-day? What problem is to be solved? Is it not to find a gaseous fuel superior to producer gas, and therefore worth distributing, and yet cheaper than that which is now supplied, because the valuable residuals should all be recovered to the last ounce? Can we not establish the real fuel value of our coke and improve the output of ammonia? Also seek out and bring to account all the value of the numerous family of hydrocarbons that is resident in the tar; and so realize a cost of production, with improved labour-saving appliances, as to enable us to supply power and heat for all purposes, trade and domestic, at charges which would make it worth no one's while to employ any other sort of fuel, especially looking to the facility of obtaining it.

The final words of the lecturer were: The claims of the war have conferred a new sphere of usefulness upon us, which, as it serves the national safety, adds nothing short of a special dignity to our work. Let us see that we spare no personal effort in this hour of trial to give the best that is in us, and, above all, let it rouse our sense of responsibility to do honour and give credit to our profession by persevering study and faithful loyalty to the worthy examples afforded by our predecessors—"The Engineers of the Last Century."

Coal-Tar Chemistry at Huddersfield.

Dr. Everest, the head of the newly-established coal-tar colour chemistry department of the Huddersfield Technical College—which is developing very rapidly—has made a report to the Governors of the College. The department was commenced in September; the idea being that Huddersfield, the headquarters of British Dyes, Limited, should become the national centre for specialized teaching and research in matters affecting the coal-tar colour industry. Dr. Everest states that Huddersfield is, and ought to remain, the most suitable place for the erection of such a national institution as is desired. Though the equipment placed at disposal by the existing chemical department of the college was such as to enable the new department to start operations in September, the interest has been so great that the laboratory and lecture-room space is already overcrowded; and no time should be lost in completing arrangements for the erection of new buildings, for which an admirable site and plans have been secured.

BRITISH COMMERCIAL GAS ASSOCIATION.

Fifth Annual General Meeting.

SOMETHING over an hour sufficed for the transaction of the business before the Fifth Annual General Meeting of the Association, which was held last Wednesday afternoon, in the hall of the Royal Society of Arts, John Street, Adelphi—under the presidency of Sir HALLEWELL ROGERS, the Chairman of the Birmingham Corporation Gas Department. As was the case in the two preceeding war years, after the remarks from the chair, what discussion there was took place on the presentation of the report and accounts.

SOME NOTES ON THE PROCEEDINGS.

FOR the second time, the members of the British Commercial Gas Association met for their annual meeting in the Lecture Theatre of the Royal Society of Arts—a lecture theatre that has for generations been devoted to the furtherance of Science and the Arts. But to-day anything relating to honest commerce is not regarded as an intrusion in such a place. Commerce is very necessary to the manufacturing industries, and the manufacturing industries to science, and science to the industries and commerce. We are not living in water-tight compartments. We are broader minded now; and our more enlightened recognition of things enables us to appreciate the interdependence existing between science and (through manufacture) the buying and selling of commodities. Therefore, the trader can meet the scientist with equal right on common ground. Both are essentials in our system of existence and progress, and necessary the one to the other. Thus there is nothing ill-fitting about the British Commercial Gas Association assembling, and discussing business, at the Royal Society of Arts. Formal though the *agenda* for the meeting was—the fashion of which formality has been set by the war—there was a goodly attendance of the representatives of the subscribing gas undertakings and firms, and everybody seemed to be glad to have the opportunity of rubbing shoulders with colleagues in the industry, whether those colleagues have to do with the administrative, technical, or commercial work of gas undertakings, or with the like work of the manufacturing concerns that are indispensable to the gas-supply industry. When in meeting assembled such as this, there is with insistence borne upon us how small and mistaken are some of the distinctions that certain people persist in setting up. However, in the meeting all parts of the British Isles could claim representation. The President (Sir Hallewell Rogers, J.P., who is going to occupy the office a second year) was in the chair. To his right-hand side was the acknowledged mainspring in the mechanism of the organization—the Chairman of the Executive Committee (Mr. F. W. Goodenough); to his left-hand side, the Secretary, Mr. W. M. Mason. There was regret that the Editor (Mrs. M. A. Cloudesley Brereton) was unable through ill-health to be present. This is the first time Sir Hallewell has presided at an annual meeting of the Association. He knows how to preside over a meeting, knows how to interest those present, how to keep the proceedings in hand, and how to put the brake on the revolutions of a discussion when in any one direction it has gone far enough. But his commencing duty was an unpleasant one. The death of Sir Corbet Woodall, the first President of the Association, has taken place since the last meeting; and to the sad event he made very graceful reference. Sir Corbet was something more than a clever engineer; he was a captain of industry, was highly esteemed, and for him all had a warm affection. It had been noticed that—so unusual is it—there were no representatives present of the Manchester Corporation Gas Department; and it was recognized without explanation that this was due to the death—which has been a painful shock to his professional colleagues—of Mr. J. G. Newbigging. To this loss the President also made feeling reference; and the members passed a vote of condolence with widow, children, and other relatives.

The National Gas Council.

The President had no prepared address to deliver to the members—the next effort in this line will probably not be until peace is restored, and it is hoped that the first meeting will then be in Birmingham. But he made an interesting extempore speech which served all that was requisite to the opening of a business meeting. It was alive with the progress of the industry, and of the necessity for ever-expanding effort the keep abreast of the general developments of the times. Contributing to this progress is the commercial work, without which the manufacturing part of the industry would have little or nothing to do; and in the commercial work the Association is to-day a factor with which the industry cannot dispense, unless it desires to reduce its motive force to the old standard, and benevolently give greater scope to competitors. The President spoke of the importance of the organization; Alderman F. S. Phillips later of how it had by its work proved its need. But Sir Hallewell sees the gas industry at this time in a transition state, by which we understand him to mean that it is passing to more important functions and to larger service. It therefore requires now and in the future the best efforts of all its forces; and so in the formation of the National Gas Council, Sir Hallewell sees that an important step is being taken for the industry, which will give it better representation, a much stronger and more influential voice, and one which will better gain the ears of Government departments in regard to the affairs of the industry than have the separated units of the past. He gave credit to Mr. D. Milne Watson, to Mr. H. E. Jones, to Alderman Phillips to Mr. H. M. Thornton and Mr. H. James Yates, for what they have done in the initial stages of the new movement, which Mr. Goodenough hopes will do much to help forward the industry's vital interests.

The Example of Birmingham.

Sir Hallewell has a keen appreciation of one of the places in the industry where there has been lack of energy in the past, and where there has been failure. One of the things that has to be done, he says, is to make people realize the national importance of the industry at the present juncture. Of course, the industry ought to have made people realize its national importance long before the war. It is an industry that has always been of national importance; it is only more so just now; and hopes to be still more so in the future. Of course, at the present time, the industry is doing much in supplying gas to munition and other factories, and the materials for the making of high explosives. But the industry will be equally pleased when it is delivering more gas for, instead of munitions, the making of goods required at home and for export, and goods needed for depriving Germany of some of the trade upon which she had built her strength for upsetting the whole of Europe and other large parts of the world. And pleased, too, will the industry be when it is supplying the materials for making dyes instead of the like materials for explosives purposes. The national importance of the industry is becoming more and more impressed upon other industries; and this trend of new recognition has to be stimulated, by making better known in the highways and byways of our industrial life the service the industry can render, and new service has to be attained by investigation and demonstration. The former the Association are doing; and of this illustration was supplied by the comment Mr. Goodenough made upon the annual report of the General Committee. In the latter regard, Birmingham, the President informed the meeting, has adopted methods which it would be well for other large cities and towns to emulate. Six years ago the Gas Department instituted a laboratory for assisting manufacturers to the efficient application of high-pressure gas. This work has grown to such an extent that the manufacturers have forced upon the department the enlargement of the laboratory, and of the staff of chemists devoted to investigating the various appliances and means of treating metals for different purposes. This work has not only present importance, but it has future significance, in that it is promoting the economy, and speeding-up and improvement of output, which are necessary in the commercial war ahead with Germany and Austria. It is quite true what the President said, that if we want to make the gas industry prosper, the hands of the engineer and the commercial man, must be joined. We would go further and say that to them must also be united the gas administrator, the gas chemist, and the manufacturer of gas plant and appliances.

The Basis of Contribution.

In presenting the annual report (with which we dealt last week), Mr. Goodenough traversed the ground covered by it; and there was general satisfaction with what is being done, and with the spreading interest and support that are being given to the Association. Later in the proceedings all and sundry in official position were thanked for their diligence in, and loyalty to, the interests of the whole industry; for, after all, the service rendered is to the industry and not to the Association, which is only the vehicle by means of which the service is accomplished. What has been done by the Association proves, as Alderman Phillips reminded those present, that, at the genesis of the Association, the time was fully ripe for bringing together the best men and the best intellects in a manner which would enable them to put their services at the disposal of the whole of the undertakings of the kingdom. But the further the Association prosecutes its work, unfolded to view are greater and greater opportunities for extending it; and Mr. Goodenough's estimate of some time ago, that the Association could spend profitably, if the industry would grant the sum, £30,000 a year has now grown to £50,000. This leads up to the point that if the Society of British Gas Industries had maintained its contributions at former level—they amounted to close upon £2000—there would have been no deficit last year. The reference to the matter in the report is not appreciated by some of the members of the Society; and the Chairman of the Society (Mr. H. M. Thornton), while praising all the Association is doing, and admitting fully the importance of its work to the interests of the manufacturers conjointly with those of the gas-

supply industry, considered that the Society was not, having regard to the times, doing so badly in the matter of contribution. In view of the large extent to which their works have been diverted from their normal course to other channels, and the fact that, unless imperative, for munition purposes, the Treasury have refused to sanction the issue by gas undertakings of new capital, one cannot help sympathizing with Mr. Thornton's attitude as the spokesman of the Society. Looking at the matter from the point of view of relative capital—the capital of the gas-supply industry, as contrasted with that of the manufacturing firms—he also thought that this showed the members of the Society were proportionately doing their part. The figures quoted will be found in the report of his remarks. Mr. R. W. Edwards was of opinion that it was time the subscriptions were put on a proper basis as between the gas-supply industry and the manufacturing firms, by founding them on capital or profits. His view is that profits are preferable. A point was made by Mr. Thomas Glover (of Edmonton), when he mentioned that the contribution of the gas undertakings of 2s. 6d. per million cubic feet of gas sold represented only 1s. 8d. per cent. of the revenue from the sale of gas, calculating it out at 3s. per 1000 cubic feet. He ventured to assert that, if the members of the Society of British Gas Industries were assessed on the basis of 1s. 8d. per cent. of the revenue from the gas apparatus they supplied, their subscriptions would amount to a smaller sum than £2000. If, in his opinion, subscriptions could be based on output, it would perhaps be a little better. But it cannot be seriously thought the members of the Society would be prepared to put into the hands of competing firms the power to gauge their output by the subscriptions paid to the Association. We are afraid, too, if the quest for a definite basis of contribution as between the gas-supply industry and the Society is successful, there will be much objection to the suggestion that a list of subscribing gas undertakings and manufacturing firms should be published, together with the amount of their contributions. While there might be an objection to this from the point of view of the manufacturers as supplying a gauge for the dimensions of their business, there would, of course, be advantages. The industry would know which are the subscribing gas undertakings, and the measure of their support. It would also know the firms who are the friends of this co-operative movement in extending the interests of the gas industry. Mr. R. G. Shadbolt and Bailie J. A. Lindsay were other speakers; and the President put an end at the right moment to the discussion of the matter of subscription. But it was all carried on with the utmost good feeling; and no harm has been done by ventilating the matter.

Multi-Cooker Claims.

During other business following the adoption of the report, the members were pleased to hear that a communication is to be made to "Truth" challenging the "Multi-Cooker" people to prove their claims. If they cannot do so, then the funds of the Red Cross Society will benefit. We all hope they will; but there are doubts as to the acceptance of the challenge.

A Suggestion Nipped in the Bud.

The members of the Association realize that they have a great deal for which to be thankful in that they have had during the early years of the activity of the organization—and, what is equally important, still retain—the services of the Chairman of the Executive Committee (Mr. Goodenough). Mr. Archibald P. Main has a great aspiration; and he gave voice to it towards the end of the proceedings. It is that Mr. Goodenough should devote his whole time to the work of the organization, as he is sure that the gas industry would benefit through an increase of the output of gas. The compliment that Mr. Main's suggestion conveyed was smilingly brushed aside by Mr. Goodenough with the words: "I don't think I should be inclined to accept the situation Mr. Main kindly offered me." There was laughter; and an idea that has floated through the minds of more people than that of Mr. Main, received its quietus. With Mr. Goodenough in the prominent position that he now holds, which brings him every day into contact with actual trading in gas, and all the problems to which that trading on the large to small scale give rise, he is probably of more value to the Association than if he were divested of his present daily trading experience by having all his time transferred to the work of the Association.

GENERAL REPORT.

The PRESIDENT [who was very cordially received] proposed that the minutes of the last meeting be taken as read; and this was agreed to.

APOLOGIES FOR ABSENCE.

The SECRETARY (Mr. W. M. Mason) announced that letters of apology for absence had been received from the Lord Provosts of Edinburgh and Glasgow, the representatives from Manchester [owing to the regretted death of Mr. J. G. Newbigging], Mr. J. Ferguson Bell (Derby), Mr. Thomas Berridge (Leamington), Mr. W. D. Helps (Leeds), Mr. Hubert Pooley (Leicester), Mr. J. D. Smith (Belfast), and Mr. John Young (Hull). In the course of his letter, Mr. Bell said: "I should like to have been present, if only to indicate my appreciation of the valuable work that is being done by the Association for the gas industry, and am extremely pleased to know Sir Hallewell Rogers has agreed to accept the position of President for the ensuing year. I feel sure Sir Hallewell will be unanimously elected; his acceptance will strengthen and promote the best interests of the Association."

THE PRESIDENT AND AUDITORS.

Mr. F. W. GOODENOUGH (Chairman of Executive) said he had been asked also to apologize for the absence of Mr. D. Milne Watson (Managing Director of the Gas Light and Coke Company), who was unable to be present. While on his feet, he might say that the Scrutineers had reported that Sir Hallewell Rogers had been re-elected President for the ensuing year, and that Messrs. Cash, Stone, and Co. had been re-appointed Auditors.

THE LATE SIR CORBET WOODALL AND MR. J. G. NEWBIGGING.

The PRESIDENT remarked that, before he referred to anything else, he must—as any meeting connected with the gas industry would wish done—allude to the loss they had all sustained in the past year, through the death of Sir Corbet Woodall, who was a Captain of Industry. He was not only a clever gas engineer, but in every way a clever man, and a man who was held in the highest esteem among them. He felt sure that everybody who worked with Sir Corbet experienced a very warm affection for him. There was also to be mourned the death of an eminent gas engineer in the person of Mr. J. G. Newbigging, of Manchester, who had been suddenly called away from among them. He was a very able man, who was greatly respected; and those present would certainly wish to pass at the earliest possible moment a vote of sympathy with his relatives in their loss—a loss which would be felt by the whole of the gas industry. He begged to move accordingly.

Mr. GOODENOUGH seconded, with the remark that they had lost a good friend in Mr. Newbigging, and the industry a good officer.

The vote of sympathy was passed by those present rising silently in their places.

REMARKS BY THE PRESIDENT.

The PRESIDENT said he now had to move that the report of the General Committee* and the audited statement of accounts be approved and adopted. They had been kind enough to re-elect him President for the ensuing year; and therefore he was not proposing to deliver anything like a Presidential Address on the present occasion. He was hoping that the meeting would have been held in Birmingham this year; but for various reasons—principally owing to the war, and partly to the fact that they were all exceedingly busy at the present time—it was felt desirable to hold over the meeting in that city. He could, however, assure them that, whenever they did go to Birmingham, they would receive a very hearty welcome indeed. He wished to thank them sincerely for the honour they had done him in electing him President for a second term. He accepted, because he considered the gas industry was just now in somewhat of a transitional state; being engaged in the formation of a very important body—the National Gas Council.

THE NATIONAL GAS COUNCIL.

In the National Gas Council they would, he hoped, have a body which would be representative of the whole of the country, and would be able to put the views of the whole of the industry before the Government, or anybody else. Up to now, particular men holding important positions in various sections of the gas industry throughout the country had interviewed the Government on different matters; but he was sure, though their hearty thanks were due to these gentlemen for their successful efforts in the past, the industry would in the future greatly benefit by having one united body to present any arguments that might have to be put forward. The Executive of the Council were working very hard at the present time; and they hoped in a short while to be in a position to state exactly what form the new body would take. But, whatever its precise nature, he was confident that it would be in the best interests of the gas industry as a whole. In this matter of the formation of the National Gas Council, they had, as he had remarked on previous occasions, been indebted to one or two gentlemen in particular—and perhaps most of all to Mr. Milne Watson and Mr. Harry Jones, not to mention Mr. Thornton and Mr. Yates, who had taken their part in the discussion, and Alderman Phillips, who was the Chairman of the meeting held to agree to the scheme.

It was necessary that they should realize the national importance of the gas industry at this juncture. He did not think there was anything during the war which had been brought more into prominence than the importance of supplying the large munition factories with gas, and the importance of furnishing the Government with the toluol, &c., which was necessary for the manufacture of high explosives. He could not but feel, as he was sure they all did, that those working in the gas industry were engaged upon a work of supreme national importance at the present time.

WORK OF THE ASSOCIATION.

Now, in this matter the British Commercial Gas Association had played, he might say, a very prominent part. They had an excellent Executive Chairman in Mr. Goodenough; and if it had not been for his efforts, probably many of the things which had been accomplished would not have been done. He would like to thank Mr. Goodenough, both personally and on behalf of the members, for the valuable work he had done. Now what was the object of their Association? It was really the selling of gas. They had, he

* See *ante*, p. 220.

thought, got to the point at which they recognized that, not only was the making of gas important, but the selling also; and in the latter direction the Association, through its work, through its organization, and through its advertisements, in various ways helped them to sell gas. It was useless to make an article, if one could not dispose of it. In saying this, he did not wish in the slightest to minimize the work of the gas engineers. They were doing admirably, for they were producing both good and cheap gas; but the good and cheap gas being available, it was necessary to bring it prominently to the notice of people and show them how to use it to the best possible advantage.

If they would allow him a personal reference, he might say that in Birmingham they had been pushing forward remarkably. For the past half-dozen years, they had had a laboratory, by means of which to induce manufacturers to take high-pressure gas, and so increase the output. This work had grown to such an extent that the requirements of the manufacturers had forced upon them an enlargement of the scheme; and they now had chemists who were devoting themselves to assisting the manufacturers of the city in the treatment of various metals, &c., so as to procure as much as possible of the trade that the Germans had been doing hitherto. No doubt, this was only possible in cities containing a large number of small manufacturers, like Birmingham; it would not, for instance, be at all applicable to country places. They in Birmingham were fully alive to the importance of pushing the sales of gas in every way possible. Within the past few years, the sales of gas there had gone up very largely. Until 1910, they had been experiencing a compound increase of 4 per cent.; whereas since that year the increase had been 6 per cent., or 50 per cent more. This growth in the increase happened to occur at the time when they joined the British Commercial Gas Association. [Laughter.] He did not want them to understand that he put this extra increase down entirely to the Association; but it was largely due to the efforts of that body, for the way they managed their affairs was a very great aid to the selling of gas.

If they wished to make the gas industry still more prosperous, they would have to join hands—the engineer and the commercial man. There was going to be no over-lapping. The commercial man did not want to take the engineer's place; but he did think they required to have the commercial man helping the engineer to sell all the gas he produced. Each had his own place.

REPORT AND ACCOUNTS.

Mr. GOODENOUGH, on rising to second the adoption of the report and accounts, said he wished to thank the President personally for his kind remarks, which were very much appreciated, coming, as they did, from the leader of one of the most progressive gas undertakings in the country. It was pleasant for the Executive of the Association to learn that the augmented increase in Birmingham was attributed in no small measure to the work of the Association. Certainly, those who knew Birmingham would be the last to claim that the Association should have the whole of the credit, because they were well aware of the ability of the men who had control of the Corporation gas undertaking there.

Turning to the report of the General Committee, there were one or two points on which he would like to offer a few remarks. An outstanding feature was the fact that it was the third report (out of five) which had had to be presented under war conditions. He was sure those of them who cast their minds back to the occasion when the first report was presented at Manchester, must sincerely hope that, by the time another meeting came round, they would have moved from under the shadow of the European catastrophe which was hanging over them now, and so be able to meet in Birmingham under the happy conditions of peace, and reproduce (or even improve upon) the Manchester conference.

SUBSCRIBING UNDERTAKINGS AND SUBSCRIPTIONS.

It was indeed gratifying to be able to report that the list of subscribing undertakings had steadily increased right through the war. At the Executive meeting that day, it had been possible to add another undertaking to the list; and he thought he could say that at no Committee meeting had they ever had a "duck's egg." In the past year, no less than thirty subscribers had been added to the list, including such important undertakings as Bristol, Paisley, West Bromwich, Workington, and many others of note. They represented now well over 80 per cent. of the output of gas of the country. A slightly reduced revenue had to be reported for the reasons set out in the report.

He hoped that Mr. Thornton might have something re-assuring to tell them with regard to the contributions of the Society of British Gas Industries. Had their contributions been up to the old level, the Association would have come out without any deficit on the working. It had been decided in the future to publish a complete list of all the subscribing undertakings, with the amount received from each, so that everyone would know who were the friends of the Association, and to what extent, and also so that subscribers would be able to audit the accounts from their own point of view by seeing that the amounts they had contributed were properly accounted for. Whether or not the Society of British Gas Industries would similarly give a detailed statement of their subscribers, it was not yet possible to say. They were considering the matter.

DIRECTIONS OF ACTIVITY.

As the report mentioned, the expenditure during the past year had been directed particularly to topical subjects—for instance, the uses of gas in munition works, and the lighting of factories and workshops, which would become a more and more pressing matter when the war was over and the Home Office Committee's recommendations were given legal force—as he had no doubt would be done. They had also dealt with gas for baking home-made bread, and had enjoyed a most extraordinary success in this connection. They were fairly "snowed under" with inquiries for weeks after the bread advertisements appeared. Then he wanted particularly to refer to the work they had done, and were continuing to do, in regard to interesting school teachers in the subject of gas making and its use, in order that they might inculcate in the minds of the rising generation a sound knowledge of the matter, so that when they became householders and users of light and heat gas would have a fair chance of consideration with them.

This was a branch of the work which was not at all obvious to the "member in the street," if it might so be put, because he probably did not make a pastime of reading educational papers, and did not see the advertisements and articles appearing in the journals particularly directed to the teaching profession. But he would refer to a letter they had received only a few days ago from a teacher, in which, after saying: "I have seen with interest your recent announcement in the 'Schoolmaster,'" the writer went on to state that he was engaged in the preparation of a series of text-books for secondary schools, and asked for information which would enable him to give accurate details with regard to gas. This, they would agree, was a result which it was worth a great deal of money to have obtained; and it was very difficult to value in the light of its future importance to the gas industry. This was only one of the large number of letters that had been received from school teachers all over the country, showing how much they had been interested in the matter which had been published for their information. Similarly, the Association received very interesting inquiries from architects and builders, and those other professions which had such great influence upon public habits, in regard to lighting, heating, and other uses of fuel. It would, perhaps, be of interest to mention that one of the leading building trade journals periodically applied to the Association now for information and articles to publish for the information of their readers in regard to gas. In this connection, he would like to allude to the excellent work done by the Editor and her staff in the provision of matter for the Press; and he might mention that the Editor was not with them that day owing to a breakdown in her health brought on by overwork in the service of the Association. Happily, she was making good recovery; and he was sure the members would like to express their sympathy with one of their most energetic and able officers. [Applause.]

A THOUSAND-AND-ONE USES OF GAS.

He wished also to say a word about another of the productions of the Editorial Department—"A Thousand-and-One Uses of Gas," because they would like to see the output of this increased through managers taking more interest in it, and circulating it more widely. During the past fortnight, there had been communications both from South Africa and New Zealand, expressing appreciation of this publication, and saying how interesting it was, and how useful in dealing with their consumers. It was very interesting to have testimony from the other side of the globe, that their work was found valuable by the gas industry even so far away. It was not possible, or perhaps advisable, at the moment to go into details regarding the plans which were maturing for the "after the war" period; but he wanted to assure members that the Committee were not slackening their energies. They realized fully the need there would be of special effort after the war was over, in order to carry things through the very difficult period of re-adjustment of industry throughout the country that was bound to follow the cessation of hostilities.

COKE DEPÔTS.

Reference was made in the report to the establishment of depôts up and down the country for the supply of suitable coke for motor-waggons. A conference was held a few days ago in Birmingham to consider this subject, under the chairmanship of Mr. J. Ferguson Bell; and they were glad to know that his services had been enlisted for the organization of this very important branch of the business.

THE COST OF PUBLICITY.

Finally, a "begging paragraph" was always inserted in the report, because they were invariably very short of money. When speaking at the original conference at Salford, when Manchester and Salford decided to join, he said the Association should have at least £30,000 a year to spend on the publicity campaign. After five years' experience, he could only state that he should have doubled this figure. They ought to have at least £50,000 in order to take advantage of all the opportunities for publicity which were continually cropping up, many of which they were having to turn down for want of money. So that if any undertaking wished to double or treble its subscription, the Committee would not be found in an unreceptive mood. He would address this observation to the Society of British Gas Industries, as well as to the gas undertakings generally.

Views of the Society of British Gas Industries.

Mr. H. M. THORNTON (Chairman of the Council of the Society of British Gas Industries) remarked that he would first of all like to say how pleased the Society was that Sir Hallewell Rogers had been elected President for a second year. He also desired

to endorse the remark which the President had made, as to the work done by the Chairman of the Executive Committee on behalf of the Association. As a member of the Executive, he (Mr. Thornton) knew, perhaps, better than others who were not on that body that they owed Mr. Goodenough very much more than it was possible to refer to in the short space of time available that afternoon. [Applause.] Now, with regard to the work of the Association generally, he was quite sure that the Society of British Gas Industries had nothing but satisfaction to express with all that had been done on behalf of the gas industry, and which indirectly must, of course, also benefit the Society. The Chairman of the Executive had encouraged him by his remarks to give further information with regard to the paragraph in the report which had reference to the subscription of the Society; and without any desire to say anything which could be regarded as antagonistic to the report, it was their view as a Society that the gas undertakings were not doing all that they ought to do in the way of subscriptions. ["Hear, hear."] They did really think that a sum of approximately £2000 coming from the Society was a very respectable amount, and as much as could be expected in existing circumstances. Taking the capital of the Society and the capital of the industry (and he took capital simply by way of illustration), the Society's proportion of the amount subscribed was satisfactory when compared with that of the gas undertakings. Assuming that there was £8,000,000 of capital in the Society and (say) £150,000,000 for the whole of the gas undertakings of the United Kingdom, it showed that the subscription of the latter should be approximately £20,000, as against the Society's £2000. As he had said, in present circumstances, they were doing as much as they could. As Chairman of the Society, he had been very anxious indeed that their subscription should be better than the previous year; but he knew of inner circumstances, which he could not lay before the meeting, that bore very hardly at the present time on different sections of the Society, although he was hoping they would be able to forward the £2000 already referred to. He would like to add that they thought the basis on which payments were being made might be reconsidered—he was not speaking of the gas undertakings only, but the Society also. It had been suggested that the payments might be based upon profits. This was not a point that need be discussed that day. As he had already said, the Society realized very fully that the work which the British Commercial Gas Association were doing was being done well. As manufacturers, they had no complaint to make in that way at all; they would be very ungrateful if they did make any. They were anxious to see the Association grow in strength, and become a still greater factor in the life of the gas industry. They agreed with the President, when he said that the commercial side of the industry must be strengthened. If this was done, and they would do all they could to help, then he was quite satisfied that they would see after the war greater prosperity than they had experienced at any time in the history of the industry. [Applause.]

A Basis of Contribution.

Mr. R. W. Edwards (Aldershot) said he felt particularly pleased to hear the remarks which had fallen from the Chairman of the Executive Committee (who had certainly become much bolder than heretofore), and also the pertinent remarks which he had drawn from Mr. Thornton, as Chairman of the Society of British Gas Industries. What they were trying to get from the Society was more money. At the present moment, there was no getting away from the fact that, of the total amount of subscriptions received by the Association, the Society of British Gas Industries contributed about 10 per cent., while the gas undertakings found the remainder. He did not think that this was a fair partnership. There was, of course, a good deal to be said on the other side. It was argued that the gas undertakings derived a tremendous lot of benefit. They did eventually. But the manufacturers got their benefit immediately; and they took their profits (if he might say so without offence) without any limitation. On the other hand, the gas undertakings were limited in respect of profits by Act of Parliament. Now, Mr. Thornton had tackled the meeting on the question of capital. Those who knew anything about capital in regard to the history of gas undertakings were aware, in this connection, that if it had not been for the consolidation and watering of the capital, it would have borne a very different aspect to-day. Therefore, he did not think Mr. Thornton was altogether happy in tackling them on the total capital. Then the entire capital of the industry was not utilized in selling gas, but only a small proportion. Perhaps about a quarter of it was involved on the distribution side. But he was not going to argue this point; he was going to take Mr. Thornton seriously. He had tackled them on the question of capital, and said the gas undertakings should contribute more. Suppose they did, would Mr. Thornton, on behalf of his Society, also enter into a contract to contribute on the basis of his capital? He did not like the Society saying: "We are going to give £2000." What was wanted was to get the matter on a business footing. Let them have it on the basis of their capital, or their profits, which he thought would be better. He certainly regarded that day's meeting as most encouraging. The question they were discussing was a delicate one, which he had talked about ever since the Association had been in existence; and now, it seemed to him, they were coming to see eye to eye to a great extent. He did hope that one of the things the Executive Committee would do would be to seriously consider the adoption of some plan in the near future whereby not only might the subscriptions from the gas undertakings be increased, but those of the Society of British Gas Industries also—either on the basis of capital or of profit.

A Third Alternative.

Mr. Thomas Glover (Edmonton) said that, if he might follow after the two previous speakers, he would like to try and help to throw a little further light on this point. Mr. Thornton had referred to the question of the capital involved; while Mr. Edwards was thinking of the profits. Might he be allowed to point out to them that there was even a third way of considering the matter? He believed it was a fact that the maximum subscription to the funds of the Association from any concern was based upon the output of gas—that was to say, the maximum subscription was 2s. 6d. per million cubic feet of gas made. If they analyzed this a little further, and assumed that the average price of gas was about 3s. per 1000 cubic feet, they would arrive at the result that the contribution from the gas industry towards the expense of selling their chief commodity worked out at not more than 1s. 8d. per cent. of the revenue. Now, he ventured to say that if all the members of the Society of British Gas Industries were assessed on the basis that they paid 1s. 8d. per cent. on the whole of the apparatus they supplied for the gas, it would come to a very much smaller sum than £2000. This might be a matter of opinion; but, anyway, he suggested that the subscriptions should be put on a common basis. There was another point to which he thought consideration should be given in the present circumstances, when comparing the gas undertakings with the manufacturers. The output of gas over the whole of the country had probably not been reduced during the war, whereas the output of apparatus by the manufacturers for use with the gas had, he thought, been very materially reduced. And when they remembered that many of the members of the Society of British Gas Industries were bearing heavy financial loss, and willingly sacrificing their own business for the purpose of making Government supplies, he thought consideraton ought to be given to this fact before in the future putting paragraphs in the report making rather invidious comparisons between the two sides of the industry. It seemed to him that if the statement was published that the subscriptions of the Society of British Gas Industries were a bare 10 per cent. of the total income of the Association, without taking the other facts into consideration, it would be dealing with the question in a way which was a little unfortunate. If the subscriptions on both sides of the industry were all based on output, he ventured to think it would be an equitable and satisfactory arrangement.

The President remarked that he thought it was somewhat of a pity to dwell too much on the mercenary side. ["Hear, hear."] Owing to the paragraph being put in the report, expressing the hope that the Society of British Gas Industries would in future pay a little more, naturally the Chairman of the Society and Mr. Glover, and several other members had taken this matter up. The Society promised them £2000, and had sent £1737. If they had forwarded the whole £2000, the Association would have had a balance of something on the right side; and no doubt this was what the Chairman of the Executive had in mind. It was in the interests of both the Society of British Gas Industries and the gas undertakings to support the Association loyally. He would like to take this opportunity of saying in public what he had said at the meeting of the Executive Committee, with regard to the members of the Society of British Gas Industries, that they had worked loyally and well. He did not think that any member of the Society who had joined the British Commercial Gas Association had played for his own hand, but all had worked entirely for the welfare of the industry in general. They should commiserate with the members of the Society that their profits were so small at present, and say that at any time they came into liquidation they would be glad to support them. [Laughter.]

The Position of the Report.

Mr. R. G. Shadbolt (Grantham) said he took it that the report was in draft form.

The President replied in the affirmative.

Mr. Goodenough: It is the report of the Committee to the meeting.

Mr. Shadbolt: It is surely subject to any alteration within reason. I was going to suggest that it would perhaps end this unfortunate matter in regard to invidious distinctions if the paragraph in the report dealing with the matter which has been referred to was entirely deleted.

Mr. Goodenough: The report has already been printed in the "Journal of Gas Lighting" and in the "Bulletin" of the Association, so I am afraid it is not possible to withdraw anything.

Mr. Shadbolt: I think that is a course which should not have been taken. If the meeting is to consider the report, it should have amending powers. The thing should not be so far advanced as to prevent that.

Mr. Goodenough: We are only following the precedent of the Institution in publishing the report before the annual meeting.

Mr. Shadbolt: Subject to adoption.

Mr. Goodenough: I mean you cannot delete a paragraph that has appeared, so far as its effect on readers is concerned. I think the suggestion was that the paragraph should not go forth to the industry as a whole. It has gone forth in being published.

Mr. Shadbolt: The report is submitted to us as members of the Association. If we wish certain things deleted before it is issued to the public, what is there to prevent this being done?

Mr. Goodenough: The fact that it has been issued to the public.

The PRESIDENT: Would you wish to alter the pious hope that the Society of British Gas Industries would in the future contribute a larger sum than 10 per cent.? Do you object to that?

Mr. SHADBOLT: I must be getting very poor indeed at expressing myself if that is the impression I have conveyed. An invidious distinction is made; and I suggest that the paragraph would be better out than in. If it cannot come out, it cannot; but it is a state of affairs which ought not to exist.

The PRESIDENT: I quite see Mr. Shadbolt's point. If it had not gone forward, it would have been better not in; but having gone forward, I think it would be rather invidious to alter it at the present time. That is my firm opinion.

UNDERTAKINGS OUTSIDE THE ASSOCIATION.

Bailie J. A. LINDSAY (Leith) said he had listened with great interest to the criticism which had, in quite a friendly spirit, been aimed at the Society of British Gas Industries; but it seemed to him that their thoughts might be more profitably directed to the undertakings which were giving them nothing, than to a Society who were giving them in the neighbourhood of £2000. Possibly owing to his personal persuasion, he had been fortunate enough to get Mr. Goodenough to come to Scotland and see the Edinburgh and Leith Commissioners; and he got a very good reception. He (the speaker) would like to throw out the suggestion that these personal touches and conferences between the executive and the different corporations and undertakings throughout the country should be kept up. He believed that if Mr. Goodenough, or some similar representative, were to wait on gas undertakings that did not subscribe, there would be a much more practical outcome than was likely to ensue from any discussion there regarding those who were at all events giving them something, while others were not giving them anything.

Mr. GOODENOUGH remarked that one of the unfortunate and most regretted effects of the war had been that they had had to stop the district conferences, which they had found, as Bailie Lindsay had stated, of such value in connection with undertakings in different parts of the country. He would, as reference had been made to his visit, like to acknowledge the hospitable reception he received in Scotland.

The PRESIDENT said they were very glad to hear what Bailie Lindsay had told them. Personally, however, he felt at the present time, with regard to the undertakings that were not contributing, or that were not giving their full quota, that they had got such a big market, with munition works, &c., that they did not want to have anything to do with advertising. They were able to sell all the gas they could make. Of course, it was the future the Association had to look to; but he agreed with Bailie Lindsay that even now, if Mr. Goodenough could find time to visit some of the gas undertakings that were not contributing, it would be most helpful.

The resolution for the adoption of the report and the statement of accounts was then put to the meeting and carried.

THE EXECUTIVE AND GENERAL COMMITTEES.

Mr. W. H. BENNETT (Redhill) said the management of the Association had been so excellently conducted during the past year by the Executive and General Committees, that if these had been normal times it would have been a pleasure to those present to re-elect the retiring members *en bloc*. Unfortunately the times were not normal, and there were very good reasons for postponing the retirement of these members. He therefore had pleasure in moving that—"In view of the continuance of the war, the retirement from office of those members of the Executive and General Committees who would otherwise have retired at this meeting be postponed until the annual general meeting in 1917."

THE "MULTICOOKER."

Mr. GEORGE HELPS (Nuneaton) said he had much pleasure in seconding this. The Executive and General Committees had done exceptional work in the past; and there were no complaints. He would like, however, just to call attention to the fact that it would be an excellent thing if they could devote a little more energy to the keeping out of the market of those unquestionably inefficient appliances that sometimes came into it. But he knew how very difficult it was to deal with a matter like this. He had in mind, of course, especially the abomination called the "Multicooker," which he had tested himself. The sellers claimed that the user got 75 per cent. advantage; but really the user got 75 per cent. disadvantage. This was all there was about it.

Mr. GOODENOUGH stated, in reply to Mr. Helps, that the Executive Committee had that morning approved of a letter to be sent to "Truth," who had already published some information respecting the apparatus, definitely challenging the "Multicooker" people to make good their claims by a public test or increase the revenue of the Red Cross Society.

The resolution proposed by Mr. Bennett was then agreed to.

VOTES OF THANKS.

Alderman F. S. PHILLIPS (Salford) proposed a hearty vote of thanks to the President for his services to the Association. He remarked that during the past year he had had the pleasure, as a member of the General Committee, of sitting under Sir Hallewell's presidency; and those present had had an experience of him that day. They saw what a genial President he was, and how well he held the meeting together. In the same way, the meetings of the General Committee had been very pleasant, and he thought very profitable to the industry as a whole. He rejoiced in the meeting of the British Commercial Gas Association. This was only the fifth meeting; but the Association had been a very vigorous infant from its very birth. It had shown increasing vitality; and as it secured a still larger subscription list, it would display greater usefulness. Altogether the success of the effort pointed to one thing—the fact that (some of them might not at the time have known it, but they had realized it since) the time was absolutely ripe for an organization of this kind, that should bring together some of the best men and keenest intellects among them, and put their services at the disposal of the whole of the industry. They had heard some criticism in one connection of the Society of British Gas Industries. His personal experience had been, when meeting members of the Society upon the General Committee, that it had been an unmitigated pleasure to work with them, and to note how desirous they were of helping forward the gas industry. It was due to them that he should say this. In these circumstances, he had no feeling of hesitancy, and no feeling of doubt, regarding the future. Let them combine to put forth all their strength, and they would go forward with increased usefulness, the gas industry would take an ever more important position in the country, and these meetings would be not only agreeable but profitable. In past times, the gas man remained in his town, and perhaps knew one or two people engaged in the industry a few miles away. But those days were past. They had now a wider knowledge. Under the presidency of Sir Hallewell Rogers he was sure that the experience of last year would again be the experience of the coming year. Therefore he was asking them to thank him for what he had done, and also for what he was going to do for them.

Bailie LINDSAY seconded the vote, which was very heartily accorded.

The PRESIDENT, in acknowledgment, said he hoped the Association would continue to show the industry that it was a great help to them, and that it was the right thing to combine in this way. They were not at present so large a body as they might be; but he believed that before many years had passed they would embrace the whole of the undertakings, and be of great assistance to the National Gas Council. Personally, he was but a passing figure in the gas world; he was not essentially a gas man. He had happened for some years to be Chairman of a Gas Committee, the same as Alderman Phillips; but they were neither of them absolutely wedded to gas. They could help the industry by coming forward from time to time when they were in office; but the burden of the thing must fall upon the shoulders of the gas men themselves.

Mr. A. P. MAIN (Edmonton), proposing a vote of thanks to the Committees and officers, said Alderman Phillips had remarked that they all felt the time had become ripe for the formation of this Association. He (the speaker) would take a little further vision, and say he thought the time would become ripe very soon for the whole industry to realize that in Mr. Goodenough they had a genius of a unique character for the selling of gas, and that it would be enormously to the advantage of the whole industry that Mr. Goodenough, with the talents he possessed, should devote his time solely to the service of the Association. The result, he was convinced, would be a tremendous increase in the sale of gas. ["Hear, hear."]

Mr. R. S. TOBEY (Horley) seconded the motion, which was supported by the PRESIDENT, and carried with applause.

Mr. GOODENOUGH, speaking on behalf of the Committees, said all the work that was done for the Association—and the Committees did do a great deal of work—was done with the best of heart, in the most harmonious spirit, and quite as a labour of love. The reward the Committees had received had been the increasing success of the Association and the unbroken confidence of the members, as expressed at the meetings. He would like to express his thanks to the officers for the valued work they had done. The Association were extraordinarily well served by their staff of permanent officers. While thanking Mr. Main for his kind remarks, he did not think he was at the present moment open to accept the situation which that gentleman was kind enough to offer him.

Mr. MASON, for the officers, said they were all well paid, but they did their work to the very best of their ability. They had been told they tried to do too much. Mrs. Cloudesley Brereton had certainly been doing so, and was paying for it; but happily she was getting better. The settled policy had been from the very start of the Association to give the greatest possible service to the greatest possible number. They had not asked even when they received inquiries if they were from subscribers. It had been their settled policy always to give all the help they could.

After the thanks of the meeting had, on the proposition of the PRESIDENT, seconded by Mr. GOODENOUGH, been accorded to the Council of the Royal Society of Arts for the use of the hall, the members proceeded to another part of the building for tea.

The opening meeting of the one hundred and sixty-third session of the Society of Arts will be held on Wednesday of next week, when an address will be delivered by Mr. Dugald Clerk, D.Sc., F.R.S., the Chairman of the Council, on "The Stability of Great Britain." The arrangements made for the meetings before Christmas include the reading of a paper on Dec. 6, by Mr. C. M. Whittaker, B.Sc., on the "Coal-Tar Colour Industry;" and a series of Howard Lectures by Professor J. S. S. Brame, of the Royal Naval College, Greenwich, on "Coal and its Economic Utilization." These lectures will be delivered on Mondays, the 27th inst. and 4th and 11th prox.

ELECTRICITY SUPPLY MEMORANDA.

The Problem of the Small House.

A PAPER that Mr. W. B. Smith read before the Greenock Electrical Society has recently appeared in the "Electrician;" and we are sorry to see that the author made various departures from the truth when alluding to gas. This is an ancient electrical failing. We have not the space to deal with every detail of the communication, but will refer to a few of the points of interest, and treat in passing of certain of the matters that are not in accord with facts. The title of the paper is "Economy of Electricity in Small Houses;" and after carefully reading the paper we are mystified as to where the economy is to be found! Towards the end of the paper, the author gives a cost table which assumes a dwelling of only four or five apartments in which no gas or coal is used, and electricity supplies all the "necessary" light and heat. The validity of the costs depends on whether the householder and his family consider that what Mr. Smith prescribes for him and them as "necessary" meets with his and their views. He makes out that 200 units at 3d. per unit would be used per annum for lighting, which would amount to £2 10s.; that 2560 units would be used for heating, at ¾d. per unit, which would amount to £8; that only 1440 units would be used for cooking, at ¾d. per unit, which would amount to £4 10s.; that 1440 units would also be used for hot water supply which, at ½d. per unit, would amount to £3; and that other uses would claim 480 units which, at ¾d. per unit, would amount to £1 10s.—making a total of £19 10s. With the low rates per unit mentioned, if an account for £19 10s. were presented to the head of a four or five roomed house, he would have a fit. And estimates of this kind have generally a way of being on the low side, for consumers hate to be curbed in their domestic habits. It is quite evident that Mr. Smith has cut his figures down to as fine a point as possible. Take, for instance, hot water supply, for which this generous person would be prepared to let the consumer have electrical energy at ½d. per unit, he allocates to this 1440 units, which, calculated out at 3420 B.Th.U. per unit, mean that, if water had to be raised in temperature from 45° to 150° on the average, and that the electrical water-heating system showed a 100 per cent. efficiency at the tap [forgive us allowing any hot-water system such credit] only 12·8 gallons of hot water at 150° Fahr. would be the daily average allowance for baths and the score of different everyday household requirements for hot water. Evidently, too, as such low prices are charged for the current, the householder has got to pay for the wiring [Mr. Smith believes in wiring such premises for purposes other than lighting independently of the lighting circuit], the electric "fires," the cooking oven and accessories, the hot-water system, &c., and maintain them. The householder has our sympathy; and more especially as Mr. Smith points out that the "prices of material have advanced; and it is questionable if they will be reduced for some years to come." We ponder again over the title of the paper—"The *Economy* of Electricity in Small Houses."

Other Sample Points for Note and Criticism.

Mr. Smith states that light for light electricity at (say) 3d. per unit is more economical in running costs than the older methods. Is he prepared to show us a domestic metallic filament lamp that will return the user more than 800 candle-hours per unit? Is he prepared to prove to us that 100 cubic feet of gas cannot be purchased for 3d. at 2s. 6d. per 1000 cubic feet? Is he prepared to demonstrate to us that modern inverted burners (which are not so expensive as metallic filament lamps) will not return in light to the consumer 20 candle-hours per cubic foot of gas consumed, and therefore 2000 candle-hours for 3d.? Then small houses have just as much right as large ones to be wired with all the attention to detail prescribed by the rules of the Institution of Electrical Engineers. If these rules are necessary for one class of house, they are necessary for the other. The author shows that the cost of a lighting installation for a house of five rooms and a kitchen would be about £17 in wood casing, and about £23 in screwed tubing; and this with inexpensive fittings in the principal rooms. Passing on, there are remarks as to room heating. Here Mr. Smith frankly admits that electricity is seriously handicapped when placed alongside coal and gas. A pennyworth of electricity at ¾d. per unit is equal to 4550 B.Th.U.; while a pennyworth of gas, at 2s. 11d. per 1000 cubic feet, has a heat value of about four times this amount. We will content ourselves by taking the parliamentary standard of 500 B.Th.U. per cubic foot (although gas has to be, and is, supplied of a heating value greater than this); and, at 2s. 11d. per 1000 cubic feet, 28·5 cubic feet would be supplied for 1d., or 14,250 B.Th.U. Now Mr. Smith, who has previously spoken of a serious handicap, declares that "the excellent efficiency of electricity for heating enables it to compete in point of cost with gas at least." We suggest to him that he has been misinformed, and invite him to demonstrate how, assuming that every B.Th.U. of the 4550 of the pennyworth of electricity is delivered into a room, it is going to compete with a modern gas-fire delivering as radiant and convected heat into a room (say) 70 to 75 per cent.—or over 10,000 B.Th.U.—of the heat generated, leaving 25 to 30 per cent. passing up the flue as waste heat, and assisting in the ventilation of the apartment. Perhaps he thinks that this cannot be done. Then if so let him demonstrate the impossibility of it, if he cares to take on the job. If he does not so care, then on what ground does he make his assertion? In the matter of electric cooking, he says that "in England, where a large amount of roasting and baking is done in the household, the electric-cooker is now extensively used." Where "extensively" in relation to gas? But in Scotland, where boiling, stewing, frying, and grilling form the greater proportion of the cooking operations, the adoption of the new method has been extremely slow. The reason that Mr. Smith gives for this is that, although the electric-oven has almost reached a state of perfection, the same cannot be said of the hot-plates on most electric-cookers." Nevertheless, "neglecting the minor shortcomings of the electric-cooker" [it tickles one a bit to see them only described as "minor shortcomings"], it can be proved that cooking by electricity is economical. Then Mr. Smith proclaims his belief in the ancient piece of fiction that, "in roasting, meat only loses 10 per cent. of its weight in an electric-oven, as compared with about 30 per cent. for a gas-oven." Is it not time that electrical people discarded this 25 to 30 per cent. of loss in baking by gas, instead of promulgating their own childish power of absorbing and using stale statements? Better by far for them to consider first whether, utilizing equal temperatures, there will not be (other conditions also being equal) much difference between the "loss" in the two systems. Of course, if an electrician chooses to use a high temperature in his electric-oven, he can go on reducing what he fondly calls the "loss of meat" until there is nothing left but something completely dried up; if he likes to practise low-temperature cooking in a gas-oven, he will be at liberty to show a different result from the use of a high temperature in the electric-oven. It is all a question of the temperature used; and electricians with brains and honesty know it. By the way, we see no mention, in the scheme of "economy," of the contribution of time economy in the heating of water.

Efficiency and Weaknesses of the Gas-Filled Electric Lamp.

An "Engineering Correspondent" has contributed an article to the "Illuminating Engineer" on gas-filled incandescent electric lamps. That these lamps are not all that their makers claim, and their "half-watt" description implies, is shown by his presentment of the facts. Reference is made to the question of the rating of the lamps, especially in connection with the variations in the distribution of light from them. There is a growing recognition that the only satisfactory basis of comparison is in terms of the total output of light—either spherical candle power or lumens. The author refers to some comparative figures published in America as to results obtained from four types of gas-filled lamps, having differently shaped filaments. The consumption per mean horizontal candle power varied between 0·595 and 0·82 watt; whereas the mean spherical candle power per watt was substantially the same in each case. This shows that for gas-filled lamps, the horizontal candle power is not a satisfactory basis of measurement. It also indicates that, for distant distribution in street lighting, there will be fluctuations in the performance of the lamps. The author points out, too, what we have remarked upon often before—that the term "half-watt" is unsatisfactory. While the higher candle-power units may operate at about 0·6 watt per candle (horizontal measurement), the high voltage low candle-power units, it is well-known, do not work at this efficiency. Then, according to some German tests, the wattage increases with life. In tests, the specific consumption of 1000-watt (220-volt) gas-filled lamps increased, in the course of 1000 hours, from 0·55 to 0·7 watt per Hefner unit (approximately 0·6 to 0·77 watt per candle). In the case of the 60 watt (110-volt) lamps, the corresponding change was from 0·72 to 0·88 watt per Hefner unit (approximately 0·8 to 0·96 watt per candle). The initial lumens per watt were given as 14 to 22·8 for various types—roughly equivalent to a range of 0·6 to 1 watt per candle (mean spherical power). These figures are regarded as being representative of good lamps. In the case of inferior types, less satisfactory results would be obtained. The performance of gas-filled lamps is affected by a variety of factors. There is, for example, the effect of the method of spacing the coils of the filament; and there is the increased temperature of the filament and the heat losses through the surrounding gas. Speaking of the costliness of the lamps and the dissatisfaction of consumers caused by several failures, the author says that, from comparisons he has made (taking into account costs of energy and replacing lamps), it appears that high candle-power gas-filled units (300-candle power or over) will in general be more economical than ordinary tungsten lamps, if the cost of energy is above 1½d. to 2d. per unit. On the other hand, experience suggests that the small 100-watt high voltage units are at present usually less economical than the vacuum lamps, even if the cost per unit is in the neighbourhood of 3d. to 4d. Allusion is also made to great diversities in experience with gas-filled lamps, especially with the smaller units. In some cases, everything goes well; in others, unexpected failures cause a lot of trouble. It is found, where the lamps are kept continuously burning, that they generally register a good long life; when switched on and off, there is a tendency to fail. It is possible that, when switched on, the temporary increase in the surge of current has an appreciable effect on the life of the lamps, especially in the case of the finer filaments. The necessity for enclosing the lamps on account of their high intrinsic brilliancy has also, in view of the temperature at which they are run, a detrimental effect on their life. Points of this kind are worth keeping in memory.

Industrial Lighting.

The members of the Junior Institution of Engineers recently had their attention directed, by Mr. Frederic H. Taylor, Assoc.M.Inst.E.E., to the subject of the lighting of industrial establishments by electricity. Speaking generally, it contained little that was new to the student of illumination; but no doubt there are a large number of members of the Institution who have not studied the question, just as there are a large number of the members and associate members of the Institution of Electrical Engineers who do not pay much heed to scientific illumination, so long as they can get custom. Scientific illumination of factories has frequently to take second place to economy as gauged by cost, and not by economy in other respects—the economy that includes output, prevention of damage to eyesight, and diminution of the risks of accident. The paper is too long for more than brief reference here; but if Mr. Taylor had told the junior engineers something more about the danger to the eyesight of workers with high intrinsic brilliancy filaments, he would have done good service, because just as rational illumination is a necessary part of the equipment of a factory for the ensuring of output efficiency, so is human eyesight. On the question of cost, there is complete agreement with the author that it is wrong to take as the only point to be considered in the selection of lamps the watts consumed per candle power, and that the total cost per candle-power-hour should be taken into account, including first cost of the lamps, life, and renewals, as well as the cost of the current. In accord, too, with the author are we that it is impossible to apply hard-and-fast rules for the lay-out of artificial lighting in an industrial establishment; seeing that buildings, work, and workers have their own characteristics, and the last-named their visual differences. The prescriptions—both for general and local lighting—of various authorities as to illumination values for different positions and work are as diversified as they can well be. Mr. Taylor instances some of these, and then suggests that "the adequate standard of illumination is such as will allow the process to be carried on or the work to be done without eye-strain, or special effort upon the part of the operator," which makes every individual operator a factor in determining the amount of local lighting. This gives an advantage to the source of light that can be regulated by a tap to the necessary amount of illumination. The essentials of satisfactory illumination, the question of reflection and colour, that of direct and indirect lighting, reflectors and fittings, are all matters that have been treated upon, until nothing new can be squeezed from them without fresh discovery resulting from research. In connection with reflectors, a point is made that is often overlooked (it is touched upon in the preceding paragraph). It is that, with the use of tungsten lamps, ventilation of the reflector or lamp fitting becomes necessary, owing to the high temperature of the filament, if the lamp is to last any length of time; and with so-styled "half-watt" units, the need in this direction is greatly increased. A practical point is that dirt on lamps may, in a short time, cause a loss of light equal to 50 per cent. A published test shows that, starting from an initial illumination of 4 foot-candles, at the end of six days this had become 2·8 foot-candles; at 18 days, 2·2 foot-candles; at 36 days, 2·1 foot-candles; and at 48 days, 2 foot-candles. The author discusses the question of whether it is preferable for manufacturers to have their own private generating plants or take a supply from the public service. The decision must rest largely upon the average overall cost, as well as reliability. A factory using both power and lighting is a particularly suitable place for a private generating plant when from it units can be obtained at an average price below the average demands of the local suppliers. And these are days when Parliament and the Law Courts will not tolerate undue preference in the matter of charging for electrical energy. The owners of private gas-driven generating plants are not troubled by such matters, nor by breakdowns in the public supply system.

Gas Contracts in France.

The French Professional Gas Syndicat, as shown in its current report in the "Journal des Usines à Gaz," continues to support the gas industry in its campaign against inequitable contracts with municipal bodies, and to keep to the fore the judgment of the Conseil d'Etat in the case of the Bordeaux Gas Company. It gives the names of some half-dozen places where arrangements have been come to in accordance with the Bordeaux judgment. At the same time, the judgment continues to attract spirited abuse from municipal authorities in some quarters, and is the subject of discussion by two eminent jurists, in the "Revue Politique"—one of whom condemns it while the other, in congratulating its authors on its justice, points out that the portion most violently criticized—viz., the reference of the dispute back to the District Court—is not an innovation in the French legal procedure, but has a precedent in a case more than twenty years ago in which the Conseil d'Etat followed the same course. But it is evident that municipal authorities are seeking to introduce legislation for the purpose of nullifying the effect of the judgment, which efforts are closely followed by the Professional Syndicat in the interests of the industry.

The will of Mr. C. E. Bloomer, the late Chairman of the Halesowen Gas Company, who died in June last, has been proved at £12,728.

THE WASHING OF GAS BY TAR.

A German Invention.

In 1887, the patent specification was published [No. 4888] of an invention relating to improvements in obtaining hydrocarbons from gases. The inventors were Fritz Friedländer and Julius Quaglio, both residents in Germany. Their proposals are of particular interest—historically as well as technically—and so, as we do not appear to have done so previously, we may place them on record.

The specification states: In the volatilization or destructive distillation of fossil coal, shale, petroleum, tar oils, and residues of distillation, the gases contain notable quantities of hydrocarbons—such as benzol, toluol or toluene, and naphthalene—which remain dissolved in a gaseous form.

According to an older process, these may be recovered by conducting the gases through tar-oils, medium or heavy oils, in a suitable scrubber or washing apparatus which absorbs the dissolved vapours, and the hydrocarbons in question may then be recovered from the tar-oil used for washing by distillation, while the tar-oil is alleged to be fit for re-use. In using this process on a large scale, it has, however, been found that, after repeating the washing and re-distilling even a few times only, the tar-oil becomes thickened to the consistency of syrup, and can no longer be used. Consequently, the process could only be used if a complete distillery for working-up tar and tar-oil is available in the immediate neighbourhood.

According to our invention, thin red or very liquid tar is used directly, instead of tar-oil. The gas, particularly that from coke-furnaces arranged for the recovery of bye-products, is conducted through the tar in a gas washer or scrubber of any convenient construction; and the tar which passes away is re-used for washing as long as it remains capable of absorption. When it is sufficiently saturated, the absorbed oils are distilled off (if desirable, through naphthalene), and the remaining tar can be used for paint or for making roofing-board, while fresh tar is used for washing the gas. Tar from which the highly volatile oils contained therein have been previously removed by distillation is particularly effective in dissolving the vapours of very volatile oils. Such tar may even be repeatedly used for washing the gases after the hydrocarbons absorbed thereby have been distilled off; and this as long as it is liquid enough for such use. In this manner, the recovery of the hydrocarbons dissolved as vapours in the gas can be practically effected without appreciable loss and at very little cost.

The patentees claimed:

(1) The employment of thin or very liquid tar for washing gases which hold vaporized hydrocarbons in suspension, for the purpose of recovering the hydrocarbons by subsequent distillation of such tar.

(2) The utilization and employment of tar from which the highly volatile products have been previously separated whether used once or repeatedly.

CONTROLLING MIXTURES OF GAS AND AIR FOR GAS-FURNACES, &c.

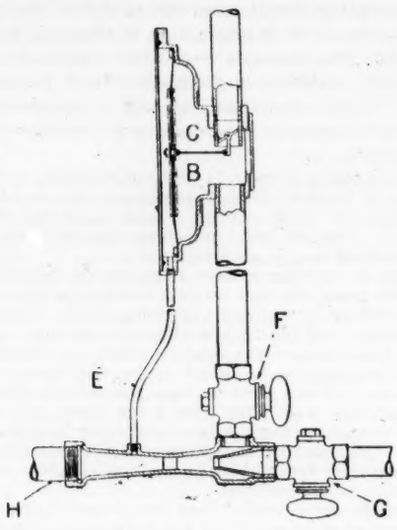
The Keith System.

A new system of controlling mixtures of gas and air for gas-furnaces, &c., has been devised to combine the advantages of the gas and air blast system with those of the high-pressure gas system, and also to eliminate the disadvantages inseparable from both systems.

In the ordinary gas and air blast system the chief disadvantage is that if the adjustment of one of the constituents of the mixture is altered, the other constituent must be also altered if the proportions of the mixture are to be kept correct. Consequently, if the adjustment of the desired temperature is left in the hands of an unskilled person, it is very seldom that the most economical results are obtained, due to this cause alone. Even if the proportions are correctly set by hand in the first instance, a rise or fall in either the gas or the air pressure mains may seriously alter the mixture. The consequence of this is that where the air-blast method is used, it is almost impossible to ensure that the correct mixture shall be invariably maintained, even where the control is in charge of a skilled person. As a result, it has been found in practice that where the direct high-pressure gas method can be used, considerable economy can generally be effected. There are, however, limits to the usefulness of the high-pressure gas system, more especially where very high temperatures are required, or where the resistance of the furnace, &c., is high.

In addition to difficulties introduced by variations of pressure or alterations of adjustment in the case of the blast system, there is a further trouble to which both systems are subject which also affects the proportions of the mixture. This trouble is brought about by variations in the resistance to the flow of mixture, of the burner nozzle, furnace, or flue, either singly or combined, which entails constant readjustment of the gas or air supplies if a regular mixture is required. Some of these factors affect the proportions

of the mixture only between the cold and the hot condition of the furnace, &c.; but others continue to affect the mixture even after the furnace has attained its maximum temperature—such as the



Keith's Automatic Governor for Gas and Air Burning Mixtures.

opening and closing of doors in the furnace, the introduction of larger or smaller masses in the furnace, and variations in the pull or resistance of the flue.

The apparatus in the improved system, which has been patented and introduced by the James Keith and Blackman Company, Limited, consists of an injector working in conjunction with a simple governing device which controls the gas supply by means of variations in the pressure of mixture produced at the outlet of the injector. This pressure rises or falls exactly in sympathy with the resistance set up at the nozzle, or anywhere beyond, whatever be the cause. The mixture pressure is also affected by variations in the air pressure at the blast nozzle; and this also influences the governor, which compensates accordingly.

The illustration shows, in diagrammatic form, the apparatus, which is extremely simple. A governor is fitted with a light diaphragm B, which has no bias in either direction, and is connected by a link to a balanced valve C. One side of the diaphragm is exposed to the gas on the outlet side of the valve, and the other side is connected to a point on the injector by means of the pipe E, so that any variation in the pressure is transmitted to the back of the diaphragm. This has the effect of increasing or reducing the pressure of the gas supply in sympathy with the variation in the pressure of the mixture.

It should be pointed out that the actual pressure in the pipe E is a function of the pressure in the injector outlet, and therefore not necessarily the same, but is generally lower.

Between the governor and the injector there is the usual control cock F, by means of which the initial adjustment of the gas is effected. When this cock has been once set, the mixture will remain constant in quality, no matter how the pressures of the gas or air or the resistance of the furnace may vary. Any adjustment of the quantity of mixture required is effected by adjusting the cock G controlling the air supply, and without any further adjustment of the gas supply. The outlet H is connected to the burner or nozzles of the furnace, &c.

At first sight it might appear that this arrangement would give only an approximate correction of the mixture; but a careful examination of the principles involved will show that the apparatus gives an absolute correction for all variations of conditions within practical limits. It will be obvious that, apart from its economical aspect, the practical advantages of ensuring an unvarying quality of mixture are considerable.

THERMAL PROBLEMS FOR GAS ENGINEERS.

XIV.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

A Method of Comparing Combustible Gases.

Table X. illustrates a convenient method for arriving at the practical value of a fair average sample of combustible gas. It includes data for both volume and weight, as although the volume is the chief practical consideration, seeing that nearly all gases are sold or bought by the cubic foot, the weights are more directly connected with calorific value, specific heats, and other important properties.

The first and second columns show the composition by volume as ascertained by a reliable analysis, which is indispensable in all calculations of this nature; and if they concern important commercial operations, or are intended to be filed as a guide for future reference, care must be taken to secure an accurate starting point, as a slight error in "sampling" or "manipulation," at this stage, may vitiate the value of the whole. Columns 3 to 6 give the oxygen requirement for complete combustion, the air equivalent of the same, as well as the products of combustion; while columns 7 to 11 give similar details in terms of pounds avoirdupois. Columns 6 and 11 show the total products, including all foreign incombustible matter contained either in the gas or the air concerned; and if oxygen is present in the gas, it is considered to contribute towards the combustion requirement of that element, and to diminish to a proportionate extent the additional supply of air or of oxygen required. Provided that the risk of back-firing and explosion can be prevented, there is no reason why the complement of oxygen necessary for combustion should not be previously mixed with the gas, forming a self-containing mixture that does not absorb oxygen from the atmosphere in which the combustion takes place.

The effect of foreign incombustible matter is the same whether it is introduced as a component of the combustible or of the combustion supporting atmosphere. Entering the flame cold, and leaving at the full combustion temperature, it not only acts as a *pro ratâ* diluent, but reduces the initial temperature, and may be present to a sufficient extent to bring the same below the flame temperature and render the mixture non-combustible. But the presence of a moderate excess of air or other non-combustible, in quantity less than sufficient to interfere with free combustion, is not always an objection, or necessarily a waste. In condensing heating stoves and open-type geysers, the products may leave the apparatus at a temperature not greatly exceeding that of the mixture previous to combustion, and the excess does not lead to any substantial waste of heat. For some purposes, a large volume at a low temperature can be more efficiently applied than a smaller volume at a high temperature. The effect of the excess as regards waste of heat is proportionate to the temperature at which the products escape or are rejected, at the outlet of the apparatus When heating a wash-boiler, the loss would be less than when melting copper or iron.

Starting with the analysis in the second column, the oxygen required is ascertained from Table VIII., and the air arrived at by multiplying the same by 4·76. The method of calculating the products of combustion, and their specific heat (columns 5, 6, 10, 11) is explained in previous sections of this communication. Table III. furnishes the particulars that are required for filling up columns 7 to 11.

The greater the calorific value of the gas the greater the volume of oxygen or air required for its combustion. The table shows that 100 cubic feet of producer gas require 125 cubic feet of air, and a similar bulk of town gas must be supplied with 477 cubic feet. The bulk of the products is always less than that of the combustible *plus* air, on account of the shrinkage that attends both the formation of water and of carbonic acid, from their elements. The observed calorific value is 15,200 B.Th.U. in the first case and 56,900 B.Th.U. in the second, or, respectively, 121 and 118 per cubic foot of air consumed. From this it would appear that a poor gas does not necessarily vitiate or consume more air than a rich gas, as compared with the heat produced, although there exists a very general opinion to the contrary.

The "righteously indignant" town councillor is very partial to the assertion, in connection with any proposal that involves a reduction in the illuminating power of the gas (when the same is provided by a private company, and not by the local authority), that such a step means a greater degree of vitiation of the atmosphere in which the gas is consumed. This may to some extent apply to the now practically obsolete flat-flame burner, but not to gas used for heating purposes, or for incandescent lighting burners. With respect to the production of carbonic acid, the advantage is in favour of the richer gas, on account of the large proportion of hydrogen (free and combined) that is present. Producer gas contains 21·6 per cent., but town gas about 75 per cent., in equivalent of free hydrogen, to which is due the difference in calorific value. It is now known that carbonic acid is simply a diluent, and in no sense a positive poison, and that therefore the vitiating effect of the gas turns more on the quantity of air consumed than on the production of carbonic acid.

Since the introduction and general adoption of the incandescent burner, for all practical purposes the heating value of the gas is the chief consideration; and the comparative value can be considered in terms of British thermal units, rather than in terms of volume. On such a basis 152 cubic feet of town gas are equivalent to, and as much practical value as, 569 cubic feet of producer gas. The size of the set of plant required to furnish any given heating value, from the generator to the point of consumption, will turn upon the bulk of the gas to be dealt with, and not be affected by any consideration as to photometrical or calorific value. The cost of conveying a truck, or 100 trucks, of coal (say) 200 miles, and of handling at the works, will depend on the weight, irrespective of the fact that the cargo may consist of the most inferior smalls or of the best gas screened. In the same sense, the cost of manufacturing, condensing, purifying, measuring, storing,

TABLE X.—*Calorific Power, Air Consumption, and Other Properties of Producer and Town Gas.*

	Volume, Per Cent.					Weight, in Pounds.				
				Products of Combustion.					Products of Combustion.	
(1)	Composition. (2)	Oxygen Required. (3)	Air Required. (4)	Water. (5)	Carbonic Acid. (6)	Composition. (7)	Oxygen Required. (8)	Air Required. (9)	Water. (10)	Carbonic Acid. (11)
Producer Gas, 100 cubic feet.										
Hydrogen	18·9	9·45	..	18·9	..	0·10	0·80	..	0·90	..
Methane	2·7	5·40	..	5·4	2·7	0·11	0·46	..	0·25	0·32
Carbon monoxide	23·0	11 50	..	..	23·0	1·71	0·98	..	..	2·69
Combustible matter	44·6	26·35	..	24·3	25·70 and 47·30	1·92	2·24	..	1·15	3·01 and 7·38
Nitrogen	47·3	..	..	..	99·08	3·45	..	..	..	3·45
Carbonic acid	8·1	..	..	..	8·10	0·95	..	..	..	0·95
	100·0	26·35	125·43	24·3	180·18	6·32	2·24	9·62	1·15	14·79
				204·48					15·94	
Per cubic foot	..	0·2635	1·2543	2·045		0·0632	0·0224	0·9962	0·1594	
Per pound	..	4·155	19·81	33·58		..	0·35	1·532	2·5185	
Town Gas, 100 cubic feet.										
Hydrocarbons (reckoned as ethane)	2·98	10·43	..	8·94	5·96	0·237	0·88	..	0·43	0·69
Methane	30·80	61·60	..	61·60	30 80	1·321	5·28	..	2·97	3·63
Hydrogen	48·40	24·20	..	48·40	..	0·256	2·04	..	2·30	..
Carbon monoxide	10·00	5·00	..	..	10·00	0·742	0 42	..	..	1·16
Combustible matter	92·18	101·23	..	118·94	46·76 and 376·68	2·556	8 62	..	5·70	5·48 and 28·10
Nitrogen	4·66	..	..	..	4·66	0·347	..	..	..	0·35
Oxygen	1·05	less 1·05	..	..	..	0·089	less ·09	..	..	..
Carbonic acid	2·11	..	..	..	2·11	0·247	..	..	..	·25
	100·00	100·18	476·86	118·94	430·21	3·239	8·50	36·60	5·70	34·18
				549·15					39·88	
Per cubic foot	..	1·002	4·77	5·491		0·0324	0·085	0·357	39·88	
Per pound	..	30·801	146·83	168·76		..	2·61	11·271	12·173	

	Specific Gravity.		Calorific Value per Cubic Foot.		Cubic Feet to 1 lb.	Calorific Value per lb.		Specific Heat.	
	Observed.	Calculated.	Observed.	Calculated.		Observed.	Calculated.	With Oxygen.	With Air.
			B.Th.U.	B.Th.U.					
Producer gas	..	0·83	152	164	15·80	2,395	2,600	0·2571	0·5457
Town gas	..	0·422	569	564	30·74	17,491	17,357	0·910	2·838

and distributing 1000 cubic feet of 152 B.Th.U. gas will be the same as that of a similar bulk of 569 B.Th.U. The generator, condensers, washers, purifiers, holders, mains, services, and meters must be proportioned to the hourly delivery. In another respect the difference will be greater, because the specific gravity of the producer gas is just double that of the town gas, which on that account means an increase in the proportion of 7 to 5, either in the initial pressure by which the gas is caused to travel, or in the sectional area of the several appliances through which it is caused to pass.

A comparison of initial temperatures may be conducted on the basis previously adopted, taking the specific heats of the products of combustion at ordinary atmospheric temperatures. One pound of producer gas furnishes 2395 B.Th.U., and this, divided by the specific heat of the products from air and from oxygen respectively, 0·5457 and 0·2571, gives 4389° for air and 9218° for oxygen. Dealing with town gas on similar lines, we arrive at 6164° and 19,219°. This method is applicable for comparative purposes only, as such temperatures are never attained, on account of the higher specific heats prevalent at high temperatures, to say nothing of dissociation and other influences, and the immediate action of radiation and convection. The highest flame temperature attained with town gas consumed in the open is in the neighbourhood of 2400°.

(To be concluded.)

SOUTH SUBURBAN LOCOMOTIVES.

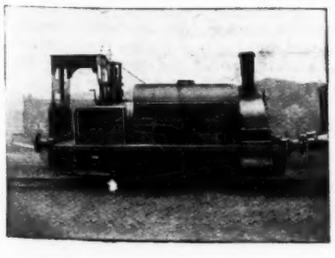
[COMMUNICATED.]

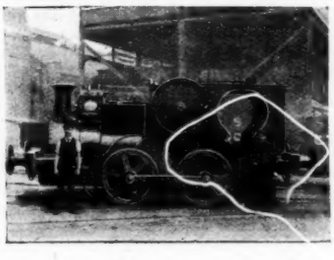
AN indispensable feature of the daily round of a gas-works is its locomotive power—ever ready to deal with the incoming coal and outgoing coke. Perhaps there are few gas-works where more strenuous tasks are provided for the locomotive engine than the South Suburban, where some 140,000 tons of coal are received annually. The Company own three engines in all, the first of which was built in 1890 by Messrs. Black, Hawthorn, and Co. It has 10-inch cylinders, 15-inch stroke, 2 ft. 4 in. coupled wheels, and a steam pressure of 120 lbs. The height from the rails to the top of the chimney is 9 ft. 6 in.; and the total weight in working order, 14 tons. This engine is capable of moving 200 tons on the level.

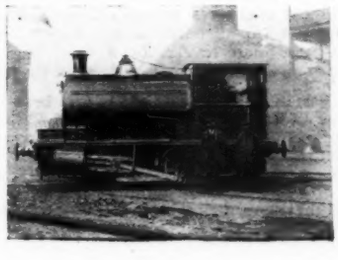
The second engine—known as the "steam-roller" on account of the fact that it is a chain-driven, fly-wheel engine—was one by Messrs. Aveling and Porter, built in 1900, at Rochester. Its chief dimensions are: High-pressure cylinders, 7½ inches, low-pressure 14 inches; boiler pressure, 160 lbs.; wheels, 4 ft. 2 in.; stroke, 14 inches; length over buffers, 20 ft. 6 in.; height, 7 ft. 10½ in.; weight, 20 tons. It has done, and is still doing, very capable service, and can move well over 300 tons with ease.

The latest arrival is one of a well-known build—the Avonside Engine Company's. This was purchased in 1909, and is in every way an improvement on the other engines. It has cylinders 14 inches diameter; stroke, 20 inches; coupled wheels, 3 ft. 3 in.; tyres, 5 inches wide by 2½ inches thick. There are 118 brass 1¾-inch tubes. Its weight is 27 tons, height 11 ft. 6 in., length 21 ft. 7 in. This engine frequently hauls 400 tons on the level.

All engines are in "active service," but not all at once, as they are used alternately. The sidings of the South Suburban Company connect with the South-Eastern and Chatham Railway between Lower Sydenham and Catford stations, and measure some three miles.



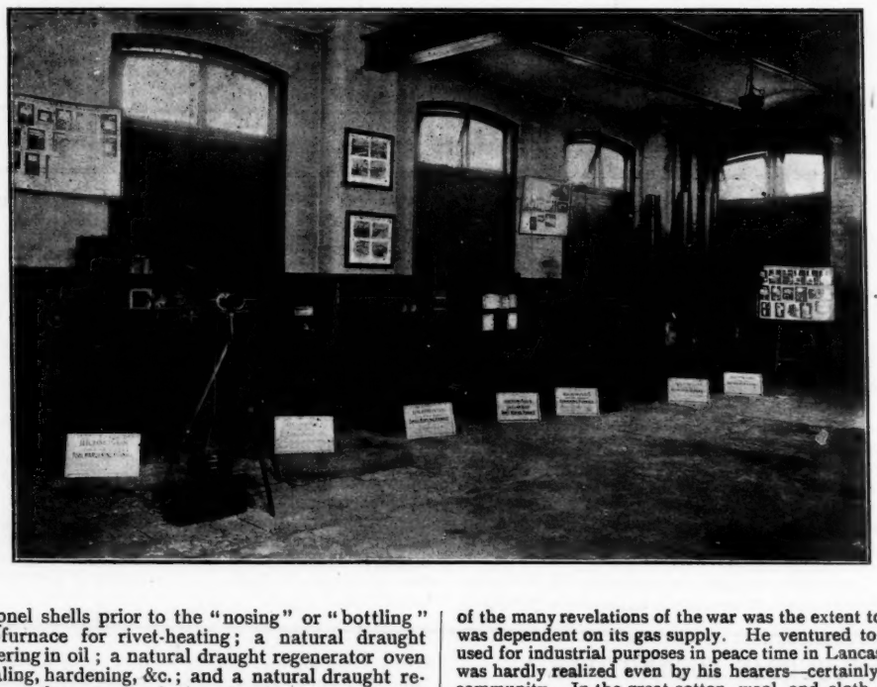




OPENING OF A GAS-FURNACE DEMONSTRATION ROOM AT MANCHESTER.

THE demonstration and test rooms which are being opened throughout the country show that the large gas undertakings are recognizing at their full value the present and future possibilities of the sale of gas for industrial purposes. It is well it should be so—not that gas for industrial uses is a new thing, although in many cases hitherto used in a crude and inefficient manner, but its well-nigh universal application and its adaptability to almost every manufacturing process are comparatively recent discoveries. One cannot imagine any method more likely to bring this knowledge home to the manufacturer than the one wherein he is invited, not to look only at cold exhibits on stands (to which we have been accustomed in the past), but to see the apparatus in actual work, and to test the furnaces and other gas appliances for himself, with his own material and under his own conditions. The latest gas-works undertaking to adopt this progressive method of developing industrial gas consumption is the Manchester Corporation. As the illustration shows, it has been conceived and executed in the spirit which has always been characteristic of the Gas Committee, led by its able Chairman, Mr. Alderman Kay, J.P.

A commodious, conveniently-situated, and well-equipped room has been provided at the Whitworth Street West meter-shops. The furnaces, by the Richmond Gas Stove and Meter Company, are representative of the principal types required in their district. From left to right in the illustration they are: A twin furnace for hardening high-speed steel tools; a twin furnace for similar tools which only require noses hardened; a blast-furnace for heating



the 3·3-inch shrapnel shells prior to the "nosing" or "bottling" process; a blast-furnace for rivet-heating; a natural draught furnace for tempering in oil; a natural draught regenerator oven furnace for annealing, hardening, &c.; and a natural draught reverberatory furnace for case-hardening, heating copper bands for shells, &c. Just beyond the range of the camera, is a large oven for drying shells after the varnishing process. These are all connected-up; the necessary blower for the air-blast is provided; a pyrometer outfit is installed; and every convenience is offered to the manufacturer to come and see for himself what service gas can render to his particular needs.

At the opening ceremony last Friday, the furnaces were all working, steel tools and cutters were being hardened, shells and rivets were being heated, billets were being annealed, and a most convincing demonstration was given. A large number of the leading engineers of Manchester had accepted the invitation of the Corporation and came in person—convincing proof of their interest; while others had sent their managers, foremen, and heads of departments. The audience was typical of Manchester's manifold activities in war time. Attendances were recorded of representatives of the national factories, the large armament firms, and prominent engineers whose products have made the fame of Manchester in all parts of the world. About 100 were present when Alderman Kay made a brief speech of welcome to the visitors on behalf of the members of his Committee.

Alderman KAY said they had always been anxious to do their utmost for the ratepayers of the city; and finding there was a large demand for information concerning gas-furnaces for all purposes, he considered it the duty of the gas undertaking to provide an opportunity to examine the latest development in this direction. It was never more necessary than now to study efficiency and economy in production; and he believed that in opening the exhibit, they were assisting to this end. The advantages of gaseous fuel were apparent at the present time. With it, there were no transport difficulties, and no delay in delivery; the mains were laid to the factory door, and the supply was always available. He expressed the hope that the Committee's invitation for manufacturers to come to the room (which would be in charge of a thoroughly competent man) and test for themselves with their own materials, under conditions which corresponded to their normal methods, would be widely accepted. The visitors, he said, would be aware of the important contribution the gas undertakings were at present making to the supply of explosives. This involved some slight reduction in the lighting power of the gas; but it did not materially affect the heating power. Manchester gas would always be found to contain well over 500 B.Th.U. per cubic foot—probably over 520. The more gas that was consumed, the larger the supply of explosives produced for the needs of the Ministry of Munitions. He added one further point which, he thought, would be of interest to those present—that the Gas Committee had under consideration a sliding-scale of prices to industrial consumers; and, had it not been for the war, this would have been settled earlier. It was the desire of the Gas Committee to give the very best service possible, and by increasing the uses of gas to reduce the evils arising from the smoke nuisance.

Mr. H. M. THORNTON, J.P., M.I.M.E., proposed a vote of thanks to Alderman Kay for his presence, and for the part he had taken in arranging the exhibition to which they had been invited. Alderman Kay, that afternoon, might be said to represent the gas industry; while he (the speaker) had the privilege of being Chairman of the Society of British Gas Industries, and therefore represented the makers of appliances for manufacturing and consuming gas. He had the opportunity of knowing the opinion that was held in the industry regarding the Chairman of the Manchester Gas Committee; and he could only congratulate the city on having in this important position a man who was recognized throughout the industry as one of its leaders, and an exceptionally able administrator. Continuing, Mr. Thornton said that one of the many revelations of the war was the extent to which the country was dependent on its gas supply. He ventured to think that the gas used for industrial purposes in peace time in Lancashire and Yorkshire was hardly realized even by his hearers—certainly not by the general community. In the great cotton, wool, and cloth industries, the part it played was neither small nor unimportant. Now, however, that the nation was at war, all energies were bent to the beating of the Germans; and the position of gas—one of the "key" industries of the nation—had become apparent. Apart from the question of explosives alluded to by Alderman Kay, gas was so largely used for the production of war materials that it had been said without exaggeration that if the supply from the gas-works in a hundred industrial cities failed to-day, the war would be lost. He was glad to feel that the building of gas-furnaces for use in this country had never been in German hands. The British maker had been awake to the problems of gas for industrial use; and in this matter, at any rate, it had not been necessary to copy the enemy. He felt satisfied that progress was still being made and the position held to-day would be maintained.

Councillor COOK, the Chairman of the Rochdale Road Gas-Works Sub-Committee, seconded the vote of thanks, and pointed out the valuable difference between an ordinary exhibit and the working demonstration given that afternoon, and the opportunity afforded the visitors of testing the furnaces for themselves under any conditions they might like to apply.

Alderman KAY, in acknowledging the vote of thanks (which was accorded with acclamation), said that the best thanks they could render him was to make the fullest possible use of the test-room by sending their materials to be heat treated. He was confident the results would be to their mutual satisfaction. Over 500 furnaces had been installed in the Manchester gas supply area since the war began; and it was the hope of the Committee that the demonstration room would be a powerful factor in adding to this number.

The demonstration was then resumed, and visitors stayed a long while to watch the interesting work and to make inquiries.

RISE AND DEVELOPMENT OF BYE-PRODUCT COKING.—III.*

[COMMUNICATED.]

THE PREPARATION AND TREATMENT OF COAL FOR COKING.

PRACTICALLY the whole of the coal used in this country for coking purposes has to be previously prepared in some way, so that the coke produced may be sufficiently good for all metallurgical processes. Certain kinds of impurities, such as shale, slate, pyrites, &c., can easily be removed by washing; but with every variety of coal there is an "irreducible minimum," constituting ash, which is so intimately associated with the coal itself that it cannot be removed at all. The principal compounds which it is necessary to remove in order to render the coke saleable are those of sulphur and phosphorus. There are many varieties of coal of really good coking quality which, unfortunately, cannot be used to manufacture metallurgical coke, owing to their high sulphur content.

If some process could be devised for liberating this sulphur during the process of carbonization, it would be a very useful and profitable acquisition to the coking industry. Various processes have been tried with the object of eliminating the sulphur; but, so far as the writer is aware, none of them has met with any substantial success. Quenching with various solutions, heating with lime, &c., have been tried; but the results have not been very satisfactory. With certain classes of coal, too, it is not possible to reduce the ash content by any appreciable amount, even by washing the coal, on account of the fact that the dirt in the coal has approximately the same specific gravity as the coal itself. The efficiency of a coal-washing plant should be tested frequently in order to prevent an undue amount of coal passing away with the dirt.

In certain districts in England, particularly South Yorkshire and Derbyshire, much trouble is experienced owing to the corrosion of the oven walls. After the ovens have been in use for a few months, the brickwork in the interior of the ovens becomes very friable, and detaches with the coke during the discharging operation. This corrosion is generally attributed to the effect of alkaline salts—and particularly sodium and potassium chlorides—in the coal on the silica contained in the bricks. It has been explained that the silica acts as an acidic radical towards the alkalies and forms a silicate, thereby causing disintegration of the brick. It has been found in some cases, however, that bricks with a high silica content are better able to resist this corrosion; so that this explanation seems inconclusive.

It has also been suggested that it is the chlorine contained in the alkaline salts which attacks the alumina in the firebricks, causing the disintegration. This latter explanation certainly fits in better with the fact that the corrosion is much less marked in the case of bricks with a high silica content. This corrosion is, however, a very serious matter in the affected districts; and a satisfactory preventative would be much welcomed. Until such is forthcoming, it is only by careful attention to the washing process that relief can be obtained. Particular care is necessary in the choice of the water used for washing purposes. In many instances pit water is employed in the washery. This frequently contains an appreciable amount of salt—indeed, the water left in the coal after washing at times contains more salt than the original coal itself.

Satisfactory treatment of the dust in coal washing is often attended with difficulties. In this connection the following quotation from a paper read by Mr. J. Drummond Paton before the Manchester Geological and Mining Society is interesting: "The question of the handling of small coal and dust at the surface is the keynote to successful washing; and the policy which has long been adopted, of allowing all the small coal under one millimetre cube to pass into the washery, is radically wrong. . . . Numerous trials and experiments have proved that small coal, from 0·5 millimetre cube downwards, could not be enriched in washers." Mr. Paton recommends percussive screening as the best solution; and the writer is assured that this treatment has been very successfully adopted.

Unfortunately, from the point of view of many colliery owners, all coal cannot be converted into coke. Many varieties of coal do not possess that "caking" property by virtue of which the particles of coal adhere together on carbonization and form a dense and homogeneous mass of coke. Exactly what constitutes the "caking" property of the coal is not known. Some kinds of coal are absolutely devoid of any tendency to bind together, and when carbonized leave the oven in the same state of division as when they entered. Generally speaking, a coal which contains a high percentage of oxygen possesses little coking power, though there are several well-marked exceptions. Probably the best coking coal in the country is that mined in Durham, while excellent coke is also obtained from Yorkshire and South Wales coals. Different coals behave in different ways when carbonized under the same conditions, and consequently the method of treating the coal has to be adapted to the particular class of coal to be dealt with. The average Durham coal is charged into the ovens in a normal state—that is to say, containing about 2·5 per cent. of moisture, and crushed to the degree of fineness—viz., about ⅜ inch—0 inch. The coal is not compressed in any way, and a good hard, dense coke is produced. The coke is of about the same volume as that occupied by the original coal, and no difficulty is experienced in pushing the coke from the ovens. In South Wales the coal is charged in the same way, but has a tendency to swell on being carbonized. Unless care is taken, therefore, the oven walls might be damaged, and difficulty also experienced in pushing the coke from the oven.

In Cumberland, still another variation is met with. There the coals contain about 30 per cent. of volatile matter, as against about 25 per cent. in Durham and 15 to 20 per cent. in South Wales. If the coal is charged into the oven as in Durham, the coke produced is soft and friable, and will not stand much handling. In order to produce a harder and denser coke, the coal is compressed into the form of a cake containing about 10 per cent. of added moisture, and so charged into the oven. The coke obtained by treating the coal in this manner is quite suitable for furnace work.

After passing through the washery, the coal goes into a drainage bunker, and the surplus water is allowed to drain off. In almost every instance nowadays the coal is crushed to a fine state of division before being charged into the ovens. Originally the ovens were charged with coarse coal of varying sizes; but it was found that the introduction of a crusher enabled better coke to be produced, and also allowed the use of compressing machinery. The employment of compression has undoubtedly been a factor in the development of bye-product coking in certain districts, especially in those where the coal was rich in volatile matter. Two methods of charging the crushed coal into the ovens are employed—viz., (1) from above, the coal passing through holes in the roof of the ovens; and (2) through a door, the coal being fed into the oven in the form of a compressed cake. In the former case, the charge is levelled in the oven by means of a beam which travels backwards and forwards through the oven. The method of charging adopted depends on the nature of the coal. Generally speaking, a coal containing above 25 per cent. of volatile matter has to be compressed, while coal with less than 25 per cent. is charged in the normal state. These methods are adopted with all types of ovens, as the principles of coking involved are the same in all cases.

Before dealing with the machinery employed in the various charging and discharging operations, &c., in connection with coke-ovens, it is desirable to decide what shall be their motive power. There is no doubt whatever electricity is far superior to steam for this purpose. It is more easily installed, controlled, and operated, and, as most of the power is required intermittently, it is more suitable in every way than steam.

In cases where the ovens are charged from above, it was usual until quite recently to have three single tubs charging into corresponding holes in the roof of the oven. The tubs were pushed along the top of the ovens by hand; and the operation of charging was both laborious and slow. Consequently, a large amount of smoke was produced, and much gas—and incidentally the bye-products contained therein—was lost.

This method of charging has now been largely superseded by the introduction of electrically operated charging apparatus which consists of a machine having three hoppers capable of containing together a quantity of coal sufficient for one oven charge. The machine, which is usually electrically operated, runs on the top of the ovens, and the coal is charged through three holes corresponding to the outlets of the hoppers. When this method of charging is adopted, the coal has to be levelled in the oven by a machine which runs alongside the battery of ovens. The coal-levelling machine carries a long beam, which, by means of suitable gearing, can be run backwards and forwards into the oven through a small door, thereby causing the coal to be evenly distributed throughout the oven.

When compressed coal is used, a combined coal compressing, charging, and coke-pushing machine is employed. This machine, which is a huge structure, carries a large receiving hopper capable of holding two oven charges of coal—about 16 to 20 tons; thus enabling it to charge two ovens for each visit to the storage bunker. The coal is dropped as required from the receiving hopper into a box corresponding in size to the oven, and the bottom and one side of which are movable. The coal is dropped into the compressor box and compressed, layer by layer, until the required quantity of coal is obtained in the box in the form of a compact cake. In order to allow of proper coherence, moist coal containing about 8 to 12 per cent. of water is used; and to still further assist cohesion, and to help to prevent breaking of the cakes during charging, straw is used towards each end of the cake. The movable side is then opened a little, and the movable bottom, or peel, is run into the oven, carrying with it the cake of coal. A stop is fixed, the peel withdrawn, and the charge of coal left in the oven. A mechanically operated compressor was most often employed until quite recently, but the introduction of a magnetic stamper has met with much success.

The coke-discharging machine consists of a ram fitted with a head, approximately equal in area to the end of the mass of coke, and by means of this the coke is pushed out of the oven. When compressed coal is used, the ram is generally combined with the compressing and charging machine; if uncompressed coal is employed, the ram and coal-levelling machine are combined. The ram head is fitted with rollers which run along the oven floor while the coke is being discharged, thus relieving the strain on the driving gear. Lifting tackle is provided for removing the coke-oven door prior to charging and discharging the ovens. In some instances, a travelling winch, moving along the top of the ovens and

* The first and second articles of the series appeared in the issues of the "JOURNAL" for Oct. 17 and 24, pp. 126, 174.

operated by hand, is employed; while in others, the lifting apparatus is attached to one or other of the machines.

Before each charge, the oven doors are usually luted in position by means of a clay "daub," so as to render them gastight. Self-sealing doors have been introduced; but their employment is confined to coke-ovens used on gas-works, as the advantages to be gained do not counterbalance their increased cost for ordinary coke-oven operations. It is important that the luting should be well done, in order to minimize the loss of gas, and also of bye-products, as much as possible.

MANCHESTER JUNIOR GAS ASSOCIATION.

Inspection of the Darwen Carbonizing Plant.

About fifty members of the Manchester and District Junior Gas Association—together with some half-dozen members of the Senior Association—availed themselves, last Saturday, of the invitation of the Mayor (Alderman John Tomlinson, J.P.), Alderman Cocker (the Chairman of the Gas Committee), Councillor George Pickup (the Vice-Chairman), and Mr. A. H. Smith (the Engineer and Manager), to visit the Darwen Corporation Gas-Works, and inspect the working of the installation of carbonizing chambers erected by Messrs. R. & J. Dempster, Limited, of Manchester. The members were welcomed at the works by the Mayor, the Chairman and members of the Gas Committee, and Mr. Smith. They afterwards inspected the plant (which has been working eighteen months); and on all sides one heard expressions indicative of the interest taken by the visitors in the Continental system of carbonizing. Mr. Smith and his capable assistants were indefatigable in their efforts to afford information to the visitors—a courtesy which was much appreciated.

The plant has a capacity of 96 tons per diem, consisting of four sets. Three of the sets have three chambers each, the other one four chambers. Each set has one furnace, with the exception of the one set having four chambers, which has two furnaces. Each of the chambers has a capacity of 7½ tons—being charged in the remarkably short time of 28 seconds. The make per ton of coal carbonized for the last six months (as shown by the monthly reports submitted to the Gas Committee) is about 12,650 cubic feet. The heating value is 529 B.Th.U.; and it was reported there has not been trouble with naphthalene stoppages.

The Business Meeting.

Mr. S. Carter, of Garston, the President, occupied the chair at the business meeting held in the Council Chamber.

The Late Mr. J. G. Newbigging.

The President, at the outset, said it was his duty to express the deepest regret of the members at the loss the gas industry had sustained by the death of Mr. J. G. Newbigging, the Chief Engineer to the Manchester Corporation Gas Department. As an Association, they had reason to value the services Mr. Newbigging had rendered to them on many occasions; and they appreciated these services very highly. Despite the fact that their friend was one of the leading lights of the gas industry, he was accessible to the juniors at all times, and readily placed at their disposal his valuable knowledge and experience. The Manchester Senior Association, of which he was recently the President, had suffered a distinct loss. He suggested that the members send through the Hon. Secretary (Mr. James Bridge) the expression of their sincere condolence with the widow and family of Mr. Newbigging.

Mr. Joseph M'Nicholl (Mossley) the Senior Vice-President of the Association, proposed, and Mr. W. Hill (Stalybridge) seconded, that this should be done—the members acquiescing by rising in silence.

An Educative Visit.

The President said the installation of Munich chambers they had inspected appealed very strongly to him, because he was accustomed to the large unit in the manufacture of carburetted water gas. He had always felt that a lot of time was wasted, and trouble and dirt occasioned, in the various processes of gas manufacture. Therefore he was much impressed by the smallness of nuisance, the quickness of operation, and, above all, the little labour necessary in the working of the new Darwen plant. It was, at any rate, something unique in the manufacture of town gas in this country. The visit had been educative to them in every way. They admired the pluck and spirit of Mr. Smith in sticking to his policy—"Tons for hundredweights"—and were glad that he was achieving such good results. He had not allowed the problem with which he was faced to overcome him, but had mastered it. He had pleasure in proposing that their best thanks be tendered to Alderman Tomlinson, Mr. Pickup, and the Gas Committee, and especially to Mr. Smith, for inviting them there that day and giving them such a wealth of information regarding the installation. He called upon Mr. Harold Davies, of Brighouse, who nineteen years ago was engaged at the Darwen Gas-Works, to second.

Mr. Davies said he did so with great pleasure. The interest displayed by the visitors in the working of the Darwen installation had been very keen.

Mr. T. Duxbury (Oldham) said that, as an honorary member of the Association, and a native of the town of Darwen—one who spent his younger days in the town—it had been most interesting to him to go over the plant. It was a unique plant—in this country, at any rate—and one that they would have to study more than hitherto. There was no better way of spending time by the juniors—he was glad to call himself a "junior" yet—than in visiting works and securing first-hand knowledge of the working of gas plant. He cordially echoed their thanks to Mr. Smith and his Committee for their kind invitation.

Alderman Cocker said they decided to instal the new system of carbonization after very careful consideration and inspection of other plants; and they had never regretted their decision. Though they were handicapped at one time by the internment of certain workmen, they overcame these difficulties—thanks to Mr. Smith's pluck and Mr. Wellington's (of Messrs. R. & J. Dempster) help—and had succeeded in achieving very good results. The returns up to now showed they had not been on the wrong tack. It had been a pleasure to the Gas Committee, and to Mr. Smith, to have the members with them that day. It was, of course, not for him as a layman to say that the system was ideal—that was a matter for gas engineers, as practical men, to decide; but up to the present every member of the Corporation was satisfied that they had adopted the proper system.

Mr. Pickup said he thought time would show that their policy was the correct one. He considered there was less of an experiment with Munich chambers than with vertical retorts. Mr. Smith deserved great credit for sticking to his guns in the way he had done. As a financial proposition, the plant would, he thought, pay the town well. He saw no reason why a plant such as theirs should not be made in England—there was no necessity to go elsewhere for it. It needed a good deal of studying; and, to his mind, one of the contributory factors to the Germans pushing it along was the terrific price of coal. The high price of coal had been the means of making them extract all the bye-products they possibly could when engaged in manufacturing coal gas; and, in his opinion, engineers here would have to contrive to solve the same problem in regard to steam. By utilizing all coal bye-products, they were helping the country immensely. He had an idea that in time the Darwen electricity station would be run by gas; but it was only an idea. There was room for both gas and electricity for illuminating and power purposes.

Mr. Smith [who was received with hearty applause] thanked the President and members very heartily for the vote. It had been a great pleasure to him to show them round the works, and to see so many members present. When he went in for the Munich system of carbonizing, it was a very bold thing to do; but the more he studied the question, the more he was satisfied that it was right, and he saw that he would ultimately achieve the advantages he was told he would secure. He was thoroughly satisfied that he had done the right thing in adopting the system; and if the time came for him to extend his plant, he should certainly recommend his Committee to put in another unit. If at any time any of them desired to go more exhaustively into the working of the system, he was at their disposal, and would readily afford them any information they desired. He begged them to accept his sincere assurance that their visit had given him much pleasure.

Toluol Extraction.

Mr. H. C. Applebee (of the Bradford Road Gas-Works, Manchester) then read a paper on "Toluol Extraction" which was followed by an informal discussion, after which

The President, on behalf of the members, expressed their thanks to Mr. Applebee, and said he hoped that the paper would appear in the "Transactions."

THE CHEMIST-ANALYST.

We have received from America a copy of No. 17 of the "Chemist-Analyst"—a little publication issued quarterly by the J. T. Baker Chemical Company, of Phillipsburg, N.J. It is a pamphlet designed mainly to advertise the Baker Company and its products; but it contains notes by different authors concerning various methods of analysis which are likely to be useful to analytical chemists generally. It is stated in the preface that the condition of the chemical business since the beginning of the war has kept manufacturers "on the jump," because it is difficult to supply the increased demand for chemicals and because prices have in many cases increased by 200 to 300 per cent.

A reprint of a note by Mr. F. E. Rowland, of the Illinois University, on "An Unusual Explosion in Connection with Potassium Chlorate," will interest all chemists. A violent explosion, which shattered a pestle and mortar, occurred while pieces of pumice were being ground in a clean mortar. Some potassium chlorate had previously been ground in the mortar, and investigation showed that the wooden handle of the pestle (which was of German manufacture) had been fastened to the lower part of the pestle by using sulphur as a cementing material. Apparently, a small amount of chlorate had previously worked its way into the joint between the two parts of the pestle; and the mixture of sulphur and chlorate exploded when subjected to a sudden jar. According to Mr. Rowland, it is well known that a mixture of chlorate and sulphur will explode when ground in a mortar; and if it became generally known that sulphur is used as the cementing material, these pestles would not be permitted to be used in laboratories. It was found that other pestles of the same type contained from 10 to 20 grammes of sulphur.

MIDLAND JUNIOR GAS ASSOCIATION.

PRESIDENTIAL ADDRESS

Of G. C. Pearson, of Windsor Street, Birmingham.

Delivered at a Meeting on Nov. 2.

Mr. Pearson opened his address with some remarks bearing on the internal affairs of the Association, and on the education of the gas man.

EDUCATION.

This, said the President, dealing with the latter point, is the age of specialization; and the man possessing particular knowledge of a process will be the man required in the future to direct that process. The tendency, which will become more pronounced, is for the various branches of a gas undertaking of any size to be controlled by men who have trained specially for particular branches; the general manager being chosen from these because of his special organizing powers. But before a junior specializes, it is vital that he shall attain a thorough grounding and general knowledge of the industry, so that he may realize the bearing one phase may have upon another. The difficulty is in obtaining direction for this course of study. The "Gas Engineering and Supply" examinations do not go far enough; and students, having obtained these certificates, often either leave off study (being contented with holding the only available gas certificates), or take up studies that, though useful, are not the most serviceable for their future work.

Lt.-Col. Bywater (our first President) suggested that an arrangement should be made with the Department of Technology of the London City and Guilds Institute for special gas certificates for passes in certain specified courses of study. This scheme has much to recommend it. I have talked over the matter with your Council; and it is our intention to confer with the other Junior Associations, as to again approaching the Institution of Gas Engineers this year upon the question. It is possible the Institution may yet consider entrance examinations for student members. The nomination to student membership of the Institution of Civil Engineers is, of course, equal to a diploma of no mean order; and in time a similar status in the Gas Institution might carry equal weight. Gas managers would then know that the student members of the Institution were young men who, though not in all cases with university training, yet had undergone a good and comprehensive course of study, in addition to possessing the practical experience obtained only at business.

We now have in the newly-formed National Gas Council a body that is representative of the industry as a whole; and these gentlemen have a tremendous amount of important organizing work to do. There is no doubt that the problem of education will come in its turn before them; and could they be induced to give this matter early consideration, great results might follow. A Council so formed is the ideal body for consideration of such a question. It is possible that the present "Gas Manufacture and Supply" examinations might be made the preliminary examinations; while the final examination could be arranged with a choice of subjects, or else subdivided into classes suitable for the particular branch of the industry the student may be fitting himself for.

WINDSOR STREET INSTALLATION OF WOODALL-DUCKHAM VERTICAL RETORTS.

It will be remembered a paper on this subject was read before the Association by Mr. Tooby, in January, 1914*—the members having paid a visit to Windsor Street works that afternoon. Mr. Tooby gave a good general description of the plant, and devoted special mention to methods of working. Since that time things have undergone no material alteration. A large number of gas-works have now adopted this system of carbonization; but I believe I am correct in stating that Windsor Street is the first large installation erected in this country. It may therefore not be out of place to submit a few remarks upon our experience with this type of carbonizing plant. Some engineers are of the opinion that the wear and tear and general repairs necessary to vertical retorts, added to their high initial cost, will prove to counterbalance any benefits they may otherwise possess over the horizontal system; and experience will give the only satisfactory solution of such a question.

The installation is of 5 million cubic feet per diem capacity, and was put to work in November, 1912—four years ago. There are 22 beds, each of four retorts, arranged in two parallel rows of 11 beds (marked A and B on fig. 1). Each row of 11 beds is divided into benches of five and six beds respectively; so that the installation consists of two benches of five beds and two benches of six beds. A chimney is provided to each of the four sections, and all connections are so arranged that any one may be isolated at will.

The nominal capacity of each retort is 5 tons per day; two days being lost each six weeks for scaling. The plant had been at work some few months before the best carbonizing temperature was determined; but once this was maintained, it was found possible to exceed the nominal throughput of 5 tons per retort per day, even while the practice (usual at Birmingham in normal times) of closing-down the works for two shifts (16 hours) on Sunday was continued. The best average figure, taken over a period of twelve months (work ceasing on the majority of Sundays) was, for the year 1914, 5·08 tons of coal being carbonized per retort per twenty-four hours of work. These satisfactory conditions prevailed until the latter end of 1915, when the throughput gradually decreased over the next few months, until we were only carbonizing a little over 4½ tons per retort per day. It is rather strange, but the two sections of five beds have proved throughout to be more efficient than the sections of six beds, and have certainly carbonized a larger share of the coal.

As was to be expected, the five bed sections were the first to show signs of wear; and it was decided to repair these two sections this summer—the five beds on A section being shut-down for the purpose in May last. The remaining sections of six beds we shall continue to work through the winter, and repair early next spring. Up to May last, the whole of the installation had been in continuous work for 1250 days, and had carbonized a total of 460,973 tons of coal, or an average of 20,953 tons per bed of retorts. Should the sections of six beds continue to work through the winter as intended, they will have worked continuously a total of about 1550 days. There has been no patching or pointing, and no special difficulties had developed in working any retorts; the number of carbonizers required upon the installation having remained as arranged in 1912, when the stint of work was fixed. The scaling of retorts had been required more frequently the last few months; the period between scaling being reduced from six to eight weeks to four or five weeks only, while a certain amount of hot patching had often been required after the scale was removed. Since the beginning of the war we have not ceased gas making regularly on Sundays as previously; but on the few occasions this has been done this year, we have found it advisable to send one or two extra men to assist in getting the charges smoothly working down the retort on the first shift when restarting gas making. The falling off in capacity may be attributed to several causes; but the chief among these are the roughness of the worn retorts causing delays in the passage of the charge, the lower carbonizing temperatures prevailing as a result of the general wear to flues and brickwork, and the widening of the retorts due to the wear of the panel bricks.

After the mouthpieces and general ironwork had been removed from the beds under repair and the work opened-out, the condition of the retorts was remarkable. The panel bricks forming the top portion of the retort had worn away considerably on the face—some of the panels being as thin as paper. The retorts having become so fragile it was difficult to believe they had lately worked so well. A little scoring from the use of rods was observed; but this was mostly on the end walls. The shape of the retorts was maintained fairly well; but the walls had caved inward about ½ inch to ¾ inch on the long side cross section. This camber may have proved to be an advantage in one sense, as it served as a counterbalance to the wear of the panels, and thus obviated undue increase in the cross-section of the retort. This is a somewhat important point.

The speed of penetration of heat in the mass of coal nearest the sides of a retort is, of course, much greater than that toward the centre of the charge; the speed gradually decreasing as the thickness of coal is increased, until a point could be reached where heat penetration ceased. It is interesting to note that for all types of carbonizing plant the speed of heat penetration for normal retort temperatures is about an average of ⅜ inch to the hour. In any case, it is obvious that in a vertical retort, should the width be increased an inch or so, the extra time required for carbonization, as compared with the additional coal thus carbonized, would greatly reduce the efficiency of working—the less the width of a vertical retort, the greater is the speed of carbonization. We think this factor is partly the cause of the reduction in coal carbonized.

The retorts and combustion chambers were cut away until good work was reached. The bottom portion of the retorts was found to be in very good condition; but the top portions had worked until completely worn out. Very little repair was necessary to the regenerators, and the producers required relining in the clinker zone. The following table gives particulars of repairs carried out to each retort of these ten beds:

Repairs Carried out to Continuous Vertical Retorts after Four Years' Continuous Work at Windsor Street, Summer, 1916.

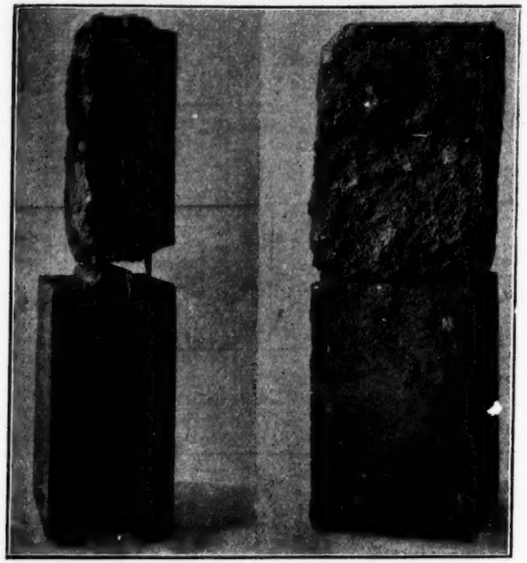
Setting No.	Distance Dismantled from Top of Setting. (Retorts 25 Feet Deep.)							
	"A" Section Retorts.				"B" Section Retorts.			
	1	2	3	4	1	2	3	4
	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
1	8 3	8 3	10 6	10 6	7 3	7 3	9 6	12 0
2	10 6	10 6	10 6	10 6	12 0	12 0	9 6	9 6
3	8 3	8 3	10 0	11 6	12 3	9 6	12 6	11 6
4	11 6	11 6	11 6	11 6	10 6	11 6	14 4	14 8
5	11 6	11 6	8 3	8 3	14 8	12 0	8 9	8 9

All these retorts were caulked with fire cement from seating castings to new work. Producers were relined where necessary. The regenerators were caulked with fire cement where required. All flues were cleaned.

A great feature was the splendid manner in which the silco

* See "Journal." Vol. CXXV., p. 150.

material had behaved. Downward from the charging stage silco material is used from the top of the furnace gas entrance flues to the combustion chamber to about 9 ft. 4 in. down; this being the zone of highest temperature. The silco panels forming the retort showed no signs of fusion or distortion; while the face was worn away to the extent of 1 inch to 2 inches.



The photograph shows two views of a typical panel brick from these retorts placed beside a new one, and serves to illustrate the wear that has taken place. Some engineers are sceptical as to the reliability of the silco brick; and I understand that the Woodall-Duckham Company have since discontinued the use of this material, preferring a tile of higher silica content, the extra expansion of which they overcome by building-in paper joints. It is needless to add that, after our experience, the repairs at Windsor Street have been carried out in silco.

It is interesting to mention that a few years ago a trial setting of segmental silco horizontal retorts was put into work at Windsor Street, and that this bed has proved to be in much better condition, after having been in work for one full season longer than beds built in accordance with our usual practice of employing Stourbridge material. With the Stourbridge material we are troubled with the buckling of the tiles, and in particular of the springer tile—thus preventing the discharge of retorts by the Arrol-Foulis machine. The silco tiles, however, kept their shape; and it was possible to push these retorts until they were let-down for repair.

In case there are members unacquainted with this material, I append an analysis of silco by Dr. J. W. Mellor. The high iron content is apparent from its appearance, and although not so refractory as some materials containing a higher percentage of silica, yet an advantage is gained in the low expansion test.

	Per Cent.	
Silica (S_1O_2)	90·08	Expansion, 0·27 per cent.
Titanic oxide (T_1O_2)	0·40	
Alumina (AL_2O_3)	6·26	
Ferric oxide (Fe_2O_3)	1·87	
Manganese oxide (MnO)	..	
Lime (CaO)	0·33	Refractory test, 1670° C., 3038° Fahr.; cone, 30.
Potash (K_2O)	0·60	
Soda (Na_2O)	0·40	
Loss when calcined over 109° C.	0·11	
Magnesia (MgO)	0·05	

The brickwork of a continuous vertical retort is subjected to a good deal of friction and rubbing by the passage of the charge peculiar to the system; and this would partly account for the wearing away of the face of the panel bricks. It must also be taken into account that the top portion will incur the greater wear, in consequence of the taper of the retort. Corrosive action, however, has considerable influence, as a close inspection of one of the worn panels will show; the rough surface being covered with a thin scale. As the surface of the brick is thus attacked it fuses

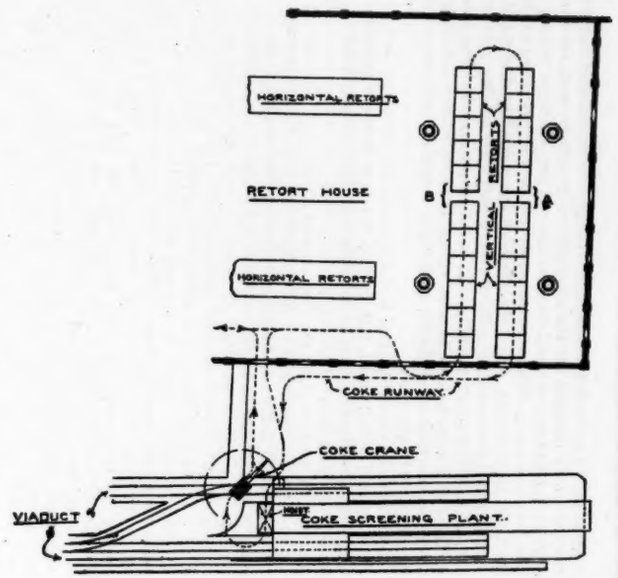


Fig. 1.

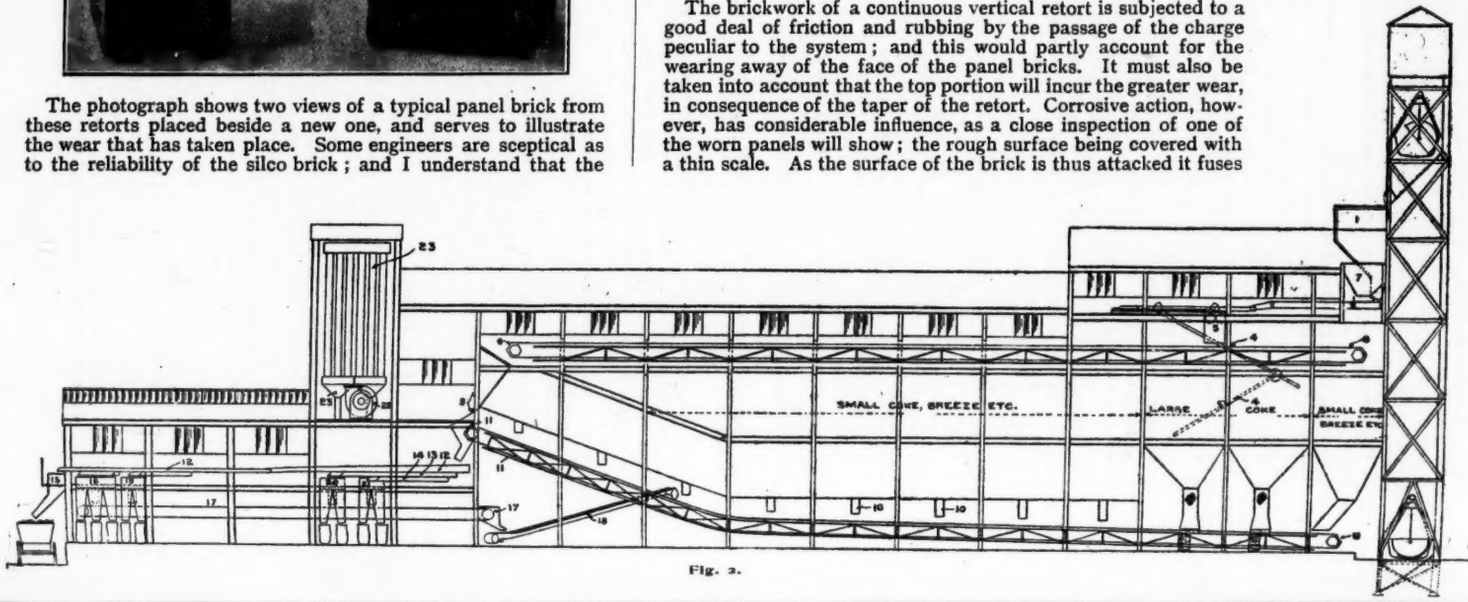


Fig. 2.

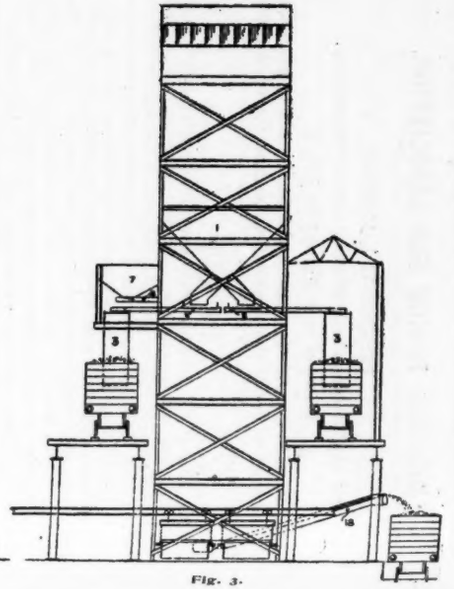


Fig. 3.

and becomes rotten; small pieces being detached by the moving charge, thus accelerating the rate of wear. The cooling effect of the coal entering the retort would serve to retard the action to an extent; but this would only affect a small portion of the brickwork. I have no figures in regard to this corrosive effect, though in all probability this is due to chlorides from the coal.

We have come to the conclusion in Birmingham, after experience with several types of plant, that, taking everything into account, at normal times there was little commercial advantage to be gained from any particular modern carbonizing system. It would be useless to base any calculations upon the present abnormal cost of labour; but there is every indication that in future higher rates of pay will obtain, that the national educational facilities will be greater, and that, consequently, men will ask for better conditions of work. It will prove an advantage for a carbonizing system to be mechanical, and to require the minimum number of men per ton of coal, quite apart from any consideration of extra profit gained thereby, but with the object of modifying the difficulties of labour. There may be no special skill required to carry out a carbonizer's duties before hot retorts and furnaces; but there is a maximum of discomfort, and the number of men able and willing to withstand the conditions is limited, notwithstanding the comparatively good wages prevailing for this class of work.

Continuous carbonization has been a big step in improving the working conditions of the gas maker; and it is difficult to realize, when standing upon the charging stage of a properly conducted plant, that gas-making is taking place—there being an absence of heat, dirt, and smoke. A stoker's job becomes one of intelligence rather than physical endurance; and our men have so thoroughly recognized these facts, that we are often asked when we shall construct more verticals and abolish the cruder methods of gas making. Our experience in Birmingham has shown that a smaller number of men per ton of coal carbonized is required on continuous vertical retorts than with any other system that we have at work. The cost of carbonizing is, of course, proportionally reduced.

The following table gives the number of men required for four different system, the plants having been at work for some years on this basis. The number of men includes all machine men, stokers, firemen, &c., men required to clean the hydraulic mains —in short, all retort-house labour except coal handling and coke removal. The coke-ovens are heated by outside producers, and the men required for these are included.

System.	Coal Carbonized Per Day. Tons.	Total Men Required.	Tons Carbonized Per Day Per Man.
Inclines	450	105	4·28
Horizontals "F.A." machinery .	140	27	5·19
Coke-ovens	430	57	7·54
Woodall-Duckham verticals . .	400	41	9·76

REPAIRS TO CONTINUOUS VERTICAL RETORTS.

We have every reason to believe that the repairs will be a comparatively small item. Added to this we can show a considerable saving in maintenance and general charges; the cost of lighting, cleaning-up, water, &c., being very much lower than for the horizontals. I understand that an installation of continuous retorts on similar lines, but of longer cross section, allowing of a capacity of 7 tons per retort per day, has been at work successfully at Luton for the last twelve months. These retorts are designed with a new taper, improving the flow of the charge and reducing the supervision required. This should materially reduce the labour on a plant already possessing many advantages.

BENZENE AND TOLUENE.

At the present time any remarks on carbonizing plant, however brief, would be incomplete without some reference to benzene and toluene. In the production of these to meet the present demands of the Ministry of Munitions, the vertical system of carbonization is at a disadvantage compared with the horizontal system. The yield of benzene in the former is two-thirds, and of toluene one-third, that of the latter; while a greater percentage of paraffins is extracted with these fractions. This is hardly likely to be of great importance, as the future will find us well prepared with stocks of such commodities.

The great advance in the scientific application of gas has made possible the economical use of a gas of only moderate calorific value. Dilution of the gas, or the removal of some part of the constituents providing the now unnecessary luminosity, becomes practicable; the circumstances of the war having done much to educate the consumer to these changes. It has been suggested that gas-works in the future will manufacture a motor spirit; and should this be the case, the paraffin present in vertical gas will be used to advantage, although the total yield of spirit would perhaps be a little less than from horizontal gas. The removal of such light oils in the case of vertical carbonization will not give rise to naphthalene troubles; the naphthalene content being so small as to render unnecessary the introduction of any substitute carrier, such as paraffin, solvent naphtha, &c. Should the removal of light oils become a commercial proposition, the treatment of gas of high naphthlene content will be a problem, as the solvent power of benzol for naphthalene is very large compared with that of such substitutes as may be used. This is shown in the following table:

Solubility of Naphthalene.

Naphthalene required for saturation:

Benzol (sp. gr. ·880)	53·80 per cent.
Solvent naphtha	35·20 ,,
Adriatic spirit (sp. gr. ·759).	24·35 ,,
Anglo-American "Royal daylight" . .	11·70 ,,
White rose	12·03 ,,
Crown diamond.	16·10 ,,

The comparative yield of benzol and toluol from the tar made on the two systems is in approximately the same proportions as that found in the gas.

COKE REMOVAL.

The coke made by the continuous vertical retorts is dealt with separately. Fig. 2 shows the general arrangement of the plant. A and B represent the two rows of 11 beds of vertical retorts; these having been erected inside the old horizontal retort-house. The coke is removed in skips, capable of holding about 17 cwt., suspended from trolleys arranged on an overhead runway girder. The skips are conveyed to the screening plant by ponies—a pony being capable of moving three skips at one time. The track of the runway may be followed on the sketch; the route being dependent to some extent upon the negotiation of the runway from the horizontal. We have found it a great advantage in eliminating all points as far as possible, even though the distance travelled is increased. The screening plant is provided with an electric hoist, and the cage is fitted with a section of runway joist long enough to accommodate two skips. The runway thus continues through this hoist; and the skips, after being elevated and emptied, are passed on round the loop back to the retort-house. We find this scheme of coke removal possesses many advantages over conveyors, especially in the case of verticals, where the coke is quenched before discharge.

COKE SCREENING AND STORAGE PLANT.

The general arrangements are shown in figs. 1, 2, and 3. The coke-skips are placed upon the section of runway girder within the lift, raised, tipped, and the coke discharged from the lift cage automatically. A rope or chain passes round a drum fixed above the runway girder, and is attached to a weight or foot travelling in guides in the framework of the lift tower. Buffers are fixed to arrest the upward travel of the foot some distance from the top of the lift; the effect as the cage continues rising being to turn the drum. Another rope is wound round this drum, and a hook upon the end of this is attached by the lift attendant to the skip; and as the drum is turned, the skip is tilted on its trunnions and the coke tipped into the cage. The lift cage is shaped to form a shoot, and the front plate or door is hinged and fitted with rollers running on flats up the tower. These flats are not carried over the mouth of the discharge hopper 1, with the result that at this point the door falls open, and the coke is discharged; the plate coming back into the shut position on the lift going down. The coke from this hopper is delivered on to either or both of the two main jigging screens 2, their purpose being to remove the large coke (that over 2-inch). Each of these main screens can deliver the large coke on to cross conveyors 3, and thus into trucks running on the viaduct either side of the screening plant; or by the opening of a door the large coke may be deposited down shoots 4, designed to obviate breakage, into a storage hopper holding about 70 tons; or, further, the whole may be passed on either screen through crushers 5 and deposited upon a conveyor 6. Provision is made, in case of any breakdown of the electric hoist, by the side hopper 7. The skips can be emptied into this hopper by a crane running on the viaduct—this being a spare to those required for dealing with coke from the horizontals. The coke from the hopper 7 is delivered upon the first only of the main screens 2 by means of a jig conveyor 8. The coke from the large coke-bunker is delivered down shoots (provided with screen backs to remove any small coke caused through breakage) into bags upon a loading deck running the length of the plant. The unscreened material, through 2-inch, may be delivered either on to the conveyor 6 or into the bunker nearest the lift. The material may be deposited by the conveyor 6 in any part of the large storage bunker holding 300 tons, or may be delivered direct to the secondary screening plant, *viâ* the hopper 9 at the end.

Another conveyor 11 travels the length of the bunkers and delivers unscreened material from the small storage bunker and picks up from the screen backs to the large coke bagging shoots, and collects from any part of the large bunker by means of the shoots 10, delivering through the hopper 9 on to either or both of two secondary jigging sizing screens 12. The first portion of each of these screens is fitted with two decks of mesh plates 12 and 13 —the upper mesh plate having $\frac{3}{4}$-inch holes and the lower one $\frac{7}{16}$-inch holes. The material over $\frac{3}{4}$ inch then passes over a mesh plate with holes of $1\frac{1}{4}$ inch; the material over this being small coke, which is either delivered over the shoot 15 direct into carts, or, by opening a door, *viâ* the shoot 16, into bags, or upon the band conveyors 17 and 18 into trucks at the yard level. The material, through $1\frac{1}{4}$ inch (1 inch breeze), and through $\frac{3}{4}$ inch and over $\frac{7}{16}$ inch (bean breeze) are delivered, *viâ* shoots 19 and 22 respectively, into bags or trucks on the yard level by band conveyors 17 and 18. The material through $\frac{7}{16}$ inch is classed as dust, and is conveyed by a third deck 14 to the shoot 21, and thence may be loaded into bags or trucks on the yard level.

A dust-collecting plant is arranged to remove the dust clouds

raised by the various operations. Hoods are placed over the various screens and connected by pipes to a high-speed fan 22; a draught being induced, and the air and dust thus collected being finally delivered into cotton fabric tube filters 23. These filter tubes require occasional beating to keep open the texture, when the dust settles into the hoppers at the base, and is removed in bags.

The power required for the whole of the screening plant is obtained from two (duplicate) gas-engines of 80 H.P. The plant has proved to be very adaptable, and is so arranged that, in case of temporary stoppage of any one part, work can always proceed with the minimum of disorganization. The provision of storage has resulted in a great saving of labour and of wear and tear; the top main screens only being required to work for the whole twenty-four hours. During the night time the whole of the unscreened small coke is stored, and is dealt with by the day gang. During the day, while the secondary screening plant is at work, the bottom conveyor 11 only is kept running; the small material from the top main screens being fed upon this through the small hopper near the lift, and the supply to the sizing screens is added to from the large storage bunker.

The plant is capable of dealing with the coke from a vertical installation of 10 million cubic feet per day capacity, and at the present time the day work is proceeding very satisfactorily with female labour. The coke market will always have a decided influence upon the choice of a carbonizing system; and we shall find again, after the war, that one of the problems of making gas will be the disposal of coke. It has been of great advantage in Birmingham to have several types of coke to offer for sale. Coke of all qualities and grades is available to suit any purpose, and customers usually obtain satisfaction. There has, however, always been a special demand for continuous vertical coke, and during the fluctuations in the coke trade it has been a rare thing to put any of this material to stock. This coke is sold as fast as it can be made; and there are many customers who come regularly for a supply, and will not be persuaded in case of shortage to take any other material in its stead.

Scientists and others are advocating the use of a smokeless fuel; and this is considered essentially a product of low-temperature carbonization. The light, porous, continuous vertical coke is splendid fuel for house grates. It is easy to ignite, requires small draught, and makes a glowing, cheerful fire. This is not personal opinion, but is proved daily at our works by the demand for coke; the poor people of the district coming in hundreds to buy half-hundredweights. There would be immediate trouble should we attempt to substitute any other type of coke. The sale of coke in half-hundredweights alone often amounts in a day to upwards of 35 tons, realizing over £40 in coppers. Vertical coke is rather light for most industrial purposes, although we have one large customer who finds it beneficial to mix this material with furnace coke for blast-furnaces, gaining thereby an advantage in the time of a run. A distinct advantage is gained by the use of this coke for generating water gas—more gas being made per machine per day, less clinker formed, and a saving of 8 to 10 lbs. of fuel per 1000 cubic feet of gas made. The water-gas makers are always very anxious to secure vertical coke. The proportion of the various grades is approximately as follows:

Large coke, over 2 inches	35·7 per cent.
Small " " 1¼ "	32·9 "
Inch breeze " ¾ "	10·3 "
Bean " " ⅜ "	12·1 "
Dust	9·0 "

Trouble will always be experienced in disposing of the material through $\frac{1}{16}$ inch. This may be further screened, and about 30 per cent. of pea breeze (over ¼ inch) recovered. This pea breeze will be found to contain a very large proportion of bats—the smaller the grade of coke the greater the proportion of bats. The dust remaining (through ¼ inch) is so fine as to be fit only for the tip; and, taking all things into consideration, it is easier to dispose of the coarser dust. It is probable that the most economical method of dealing with the dust question will be to utilize dust for fuel to outside producers for the heating of the retorts.

Enemy Firm to be Wound Up.—An order has been made by the Board of Trade for the winding-up, under the Trading with the Enemy (Amendment) Act, 1916, of the British Incandescent Mantle Works, Limited, of Ravensbury Road, Earlsfield, S.W. The Controller is Mr. Thomas Wise, of Bassishaw House, Basinghall Street, E.C.

Ministry of Munitions Tar, Coke, and Bye-Products Order.—In pursuance of the powers conferred upon him by the Defence of the Realm Consolidation Regulations, 1914, the Minister of Munitions requires all persons engaged in the production, manufacture, purchase, sale, or distribution of any coal-tar or coke or their bye-products (including in particular tar, carbolic crystals, benzol, toluol, ammoniacal liquor, and sulphate of ammonia) to furnish to the Minister of Munitions such particulars as to output, working of plant, cost of manufacture, sales, deliveries, stock in hand, purchases, and prices as may be required on his behalf, at such intervals as may be requested. The Minister of Munitions further requires that any particulars so furnished shall be verified and authenticated by the signature of the person required to furnish the same, or where such person is a firm or company, a partner, director, or other responsible officer.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Opening Meeting of the Session.

The opening meeting of the thirteenth session of the Scottish Junior Gas Association (Western District) was held in the Royal Technical College, Glasgow, last Saturday.

Mr. DAVID FULTON (Helensburgh), in introducing the new President (Mr. GEO. T. PURVES, of the Auchengeich Coke-Ovens, Chryston), said that he relinquished the post of President with some regret. He would, however, always have the pleasantest memories of his presidential period. He hoped that the Association would not wane, but would wax in strength and become an influence and power for the good of the industry and for the members themselves.

ALTERATION OF TIME OF MEETING.

The PRESIDENT, before delivering his inaugural address, put forward a motion on behalf of the Council, who thought that the meetings in future should be held at 5 p.m. instead of 7 p.m., to allow country members getting home in better time. This was agreed to.

INAUGURAL ADDRESS.

Probably the most important recent development in gas-works practice is the extraction from the gas of benzol and its homologues, which the national requirement has forced on us. I think it can be quite reasonably claimed that this partially debenzolized gas is still satisfactory for the purposes for which the gas is produced. With the probability of increased financial return, it is a debated question whether the recovery of benzol will be continued in gas-works after the war; and probably this is largely a matter of available markets. Dr. T. Gray, in reviewing the question recently, in a lecture to the Waverley Association of Gas Managers,* indicated that if all the gas produced in coke and gas making was suitably treated, probably a yield of some 60 million gallons per annum of 90 per cent. benzol might be expected; and he quoted the consumption (119 million gallons) of imported motor spirit for 1914. Taking this in conjunction with the other known uses for benzol, there seems sufficient market outlet for all the benzol likely to be produced.

TAR-WASHING AND OIL-WASHING.

The tar-washing process which has been so largely applied is a make-shift method of extraction, justified only by the urgency of the times, and not worthy to be applied in fair-sized works after the war requirements are satisfied, although it might still be used in small works. With such treatment, the gas when it leaves the tar-washing plant will generally be saturated with naphthalene vapour; and as it must contain less condensable liquid hydrocarbons, so accentuated trouble from naphthalene deposits may be expected. This does not apply to the smaller works, where the carbonization is usually less drastic; nor probably where continuous vertical retorts are in use.

Oil-washing, which is now applied at quite a number of gas-works, as well as coke-works, is the one process likely to be seriously considered. The capital charges on a benzol plant are a very material part of the total charges; and so for economic working the material factor is throughput. On most gas-works, on account of the varying summer and winter gas production, it will be quite impossible to keep the plant at full capacity. When oil-washing is applied, in order to avoid considerable variation in the composition of the gas between summer and winter production, it will be necessary to wash the gas uniformly all through the year. The plant during the summer months will thus be partially idle; and so benzol recovery will not be quite so favourable a proposition on gas as on coke works.

The same remark would apply to a benzol refining plant; but it would be possible for some works to maintain the refining plant at full capacity all through the year by taking in crude light oil from other works during the summer months. The varying gas production referred to will have considerable influence on the type of scrubbing plant required. On coke-oven plants, tower-scrubbers with wood-filling are generally used; and the volume of washing oil is kept fairly constant throughout the year. With the varying gas production in gas-works, it would be desirable to vary the volume of wash oil *pro ratâ*. This could be done only to a very limited extent on tower-scrubbers without impairing the scrubbing efficiency. On this account, with varying gas production, rotary scrubbers, where the uniform oiling of the absorption surface can be maintained independent of the volume of wash oil circulated, would be preferable.

LIGHT OIL AND NAPHTHALENE.

On most gas-works, the operations will probably be confined to the production of crude light oil, and no refining be carried out. Whether or not refining is carried out, the quality of the light oil produced will be of great importance—greater than in coke-oven practice, on account of the requirements of the gas supply. It was formerly normal practice, on coking plants, to produce a 65 per cent. light oil; but now 60 and even 55 per cent. oil is being produced. In order to produce the higher grades of light

* See "JOURNAL," Vol. CXXXIV., p. 646.

oil, naphthalene and some of the higher benzene homologues, which are being carried away in the vapour from the wash-oil still, are thrown back into the wash oil by partial dephlegmation. In this way, the naphthalene absorption power of the wash-oil is reduced, while the benzene absorption power is unimpaired; and so the ratio of naphthalene to condensable liquid hydrocarbons in the gas may be increased by oil-washing, with the result that the danger of naphthalene stoppage in the distribution system will be accentuated. If this degree of dephlegmation is avoided, and a lower grade of light oil produced, the wash-oil will be largely denuded of naphthalene, and so a continued absorption of naphthalene from the gas can be effected with a probable reduction of the naphthalene trouble.

The light oil contains some 15 to 25 per cent. by volume, and sometimes more, of the wash-oil; and when the light oil is to be sold to a refiner, it would seem desirable on this account, and also possibly to avoid too drastic debenzolizing of the gas, to produce the highest grade of product. In my opinion, this practice on a gas-works would be absolutely wrong, on account of the influence on the content of naphthalene in the gas. It would be quite practicable to improve the grade of light oil by reducing the amount of wash-oil present. This would require a very efficient fractionating column on the crude still. The designs of crude stills I have seen for making 65 per cent. oil have not much of a fractionating column, but have instead a heat exchanger, which acts on the vapours as a reflux condenser, returning to the still some heavy products, but doing little satisfactory fractionation. The high boiling-point of naphthalene makes it difficult to get the naphthalene over without a considerable amount of wash-oil.

INFLUENCE ON SULPHUR COMPOUNDS.

There is another aspect of oil-washing which should favourably commend the practice to gas makers—*i.e.*, the removal of carbon disulphide and other organic sulphur compounds from the gas. The presence of about 1 per cent. of carbon disulphide in 90 per cent. benzol shows to what extent this product is extracted in oil-washing. There can be no question of the value and the need for keeping the total sulphur content of the gas as low as possible. Both from the profit-making aspect and as a valuable aid in purification from carbon disulphide, thiophene, &c., and naphthalene, oil-washing is worth serious consideration at all works where the output of gas and yield of benzol product justify the capital outlay. The illuminating power of the gas would be lower; but the gas would be quite satisfactory for domestic purposes, and new ideas in regard to illuminating power are likely to prevail as the result of present experiences.

POSITION OF THE BENZOL SCRUBBERS.

As you are aware, purifiers proper are not in use at coke-ovens; the benzol plant being placed after the ammonia recovery plant. From the point of view of benzol recovery, it is not material whether the benzol absorption plant precedes or follows the purifiers on gas-works plants. The needs of the purifying plant, however, will probably require that the benzol scrubbers follow the purifiers. Where the gas is to be oil-washed for benzols, it is essential that the gas be as free as possible from ammonia, as this is absorbed by the wash-oil; and, if a considerable amount is present, very serious damage may be done in the oil-heating system. I have heard of the steel tubes in the oil-heating system being seriously damaged in two weeks by ammonia. Cast iron is much more resistent, but lacks many of the advantages of steel. Great prominence was given in the 1915 report of the Chief Inspector of Alkali Works to the importance of regulating the ammonia-content of gas prior to the purifiers. The fact that ammonia is required in the gas before it enters the purifiers, and should not be present before the benzol scrubbers, indicates that the latter should follow the purifiers.

THE DIRECT-RECOVERY OF AMMONIA.

Mr. Curphy's report seems to put direct-recovery practice in a somewhat unfavourable light. At the same time, according to my reading of the report, there is no suggestion that inefficient purifier action must follow with direct recovery of ammonia. In some works, no purifier trouble has been experienced, and at others such trouble has been alleviated by allowing excessive amounts of ammonia to go forward to the purifiers, with resulting ammonia losses. While I am not able to elucidate the purifier difficulties in question by data additional to that accumulated and commented on in the report, there is one statement I would like to refer to:

> It is clear, therefore, that there is no deficiency of ammonia in the crude gas entering the purifiers, judged by comparative standards. Why, then, does it fail to produce the desired result? Is the irregular working of the purifiers due to actual shortage of ammonia on the occasions when they fail, or are other causes at work which render its beneficial effects inoperative?

The possibility of temporary shortage of ammonia in the gas is here queried; but no comparative data are quoted of ammonia tests on average samples and snap samples of gas. I find that very considerable variation occurs in the ammonia-content of the gas leaving the saturator. In normal working, with a throughput of 3 to 4 million cubic feet of hot (80° C.) gas per day, the total ammonia-content in the treated gas is about 4 to 5 grains per 100 cubic feet. When the gas has cooled down to about 15° C., this ammonia is largely removed by the condensed water. The ammonia figure refers to average tests over a period of 20 to 60 hours. The amount of ammonia passing during the most acid condition of the bath is, of course, considerably less than during the least acid condition, and so, after cooling, the gas must at times be almost completely void of free ammonia. From this, we see there is almost the certainty of ammonia shortage at times. The use of a virgin liquor washer before the purifiers, as approved by Mr. Curphy, would obviously overcome the difficulty.

INCREASING THE AMMONIA YIELD.—COAL-LIMING.

Renewed comment has been made lately on the coal-liming process as an aid to increased ammonia production. I have found that lime may in some cases increase the yield of ammonia, but not always. A short reference to some of the experiments I have made with a view to increasing the yield of ammonia may be of interest.

Professor Lewes found from the results obtained in the Coalite process that the yield of ammonium sulphate averaged about 12 lbs. per ton.* Considering this in conjunction with the yields obtained at higher oven temperatures, it is clear that secondary actions account for a considerable proportion of the ammonia usually obtained at gas and coke works; and the experiments of Tervet show that hydrogen acting on red-hot coke may play a material part to this end.† It is not practicable on coke-ovens to pass hydrogen through the mass of partially carbonized coal; but I endeavoured to get something like the same effect by wetting the bottom part of the coal charge to a greater extent than the top—the idea being that this would hold back the carbonization of the lower part until a considerable amount of red-hot coke was produced at the upper part. The gases then evolved from the bottom could react on this hot coke. No distinct increase in yield was, however, obtained; and the longer carbonization time was sufficient in itself to condemn the practice. During these experiments, it was quite clearly demonstrated that, for the best yield, the coal must be very finely crushed. I will return to this later.

These experiments were made on a single coal, and several thousand tons were carbonized. The washed coal contained about 30 to 31 per cent. of volatile matter, and was low in ash. Although no increase of ammonia was obtained, I felt that it should be possible to materially influence the yield, which at the time was about 33 to 34 lbs. of sulphate per ton of dry coal. The washed dross which was being carbonized contained a very varying amount of water; and, so long as sufficient was present to make a firm cake on compressing, no particular amount was aimed at. I decided to find out the best amount for good all-round results.

After several months' observation, this was fixed at about 12·5 per cent. with a carbonizing temperature of 1050° to 1080° C. on the flame-side of the oven walls. With these constants, an excellent coke was produced; but the output was under the designed capacity of the plant, and the best compromise was fixed at a little under 12 per cent. of moisture with the same oven-wall temperature. It may seem that several months was a long time for arriving at the two factors moisture and carbonizing temperature; but on a large carbonizing plant it takes a long time to eliminate the effects of all the disturbing factors, and laboratory results are practically useless in such an investigation. I should mention that, in arriving at these constants, no special experimental work was done; but a careful daily record was kept of the proximate analysis of the coal, its coking power, the temperature of the oven walls, and the general working results. Special note was taken of abnormal results; and the conclusions were arrived at from examining the data collected.

The next point examined was the proportions in which the ammonia yield was distributed in the gas produced throughout the carbonizing period. This involved making analysis of the gas and determining the ammonia-content during each of 36 consecutive hours. Only a few series of tests were made; but these showed clearly, when graphed, two periods of increase in ammonia content and two of decrease.‡ The highest proportion was found towards the end of the carbonizing period, and was undoubtedly largely due to secondary actions. The maximum content did not coincide with the maximum percentage of hydrogen, because the temperature was then too high. After examining hundreds of daily analyses of gas, together with the concurrent working results, I have not observed any distinct relationship between the amount of one particular gas constituent and the yield of ammonia per ton of coal; but there does appear to be a relationship between the ammonia and the ratio of hydrogen to methane. This generalization applies fairly closely to both individual charges and the general working of the whole battery of ovens. Such a relationship is just what should be expected, because, in fixing the moisture content and carbonizing temperatures at the optimum for ammonia production, the rate of decomposition of the coal has also been fixed, and so a definite ratio of hydrogen to methane should arise. The ratio in question for the one particular coal carbonized was 45 hydrogen to 29 methane, and occurred on the individual charge at about the 25th hour in a 35 to 36 hour carbonizing period.

At the end of the carbonizing period, the temperature of the bulk of the coke is at least 100° C. lower than the temperature of the flame-side of the oven wall (about 900° C. or a little more), and so at the 25th hour this coke mass is probably only about

* See "Carbonization of Coal." By V. B. Lewes.

† See "Journal of the Society of Chemical Industry," Nov. 23, 1883.

‡ See "JOURNAL," Vol. CXXVI., p. 953.

800° C. Cobb and Hollings have found* that a mixture of equal volumes of hydrogen and methane suffers a little decomposition at 800° C., and very marked decomposition at 1100° C. The decomposition of methane yields carbon and hydrogen. Burgess and Wheeler have shown† that between 750° and 800° C. there is a large and sudden increase in the quantity of hydrogen evolved. So between 750° and 850° C. we have the ideal condition for the Tervet reaction. The temperature of the carbonizing mass rises rapidly after about 800° C. is reached; and so the time is short when the conditions are favourable—probably between the 25th and 27th hour.

We might expect that, if the carbonizing mass could be maintained at about this temperature-range, a considerable increase in ammonia yield would be obtained; and, as a matter of fact, under these conditions I have found a very large increase in ammonia yield. It is not practicable to work a battery of coke-ovens in this manner; but during periods when for some cause we have not charged any ovens for 12 to 24 hours, or even a little longer, and the supply of heating gas to the ovens has steadily fallen, a marked increase in the yield of ammonia has been obtained. The necessary conditions could easily be secured with continuous vertical retorts; and I am quite convinced that, by manipulating the carbonizing conditions in such retorts, a very considerable increase in the ammonia yield could be obtained.

About two years ago I found the ash in the coal was so low that I decided it was unnecessary to wash it. We carbonized between 4000 and 5000 tons of this unwashed coal during one month, and we obtained from it about 3½ lbs. more sulphate of ammonia per ton than we did from the washed coal. At a later date when I repeated this proceeding, under apparently the same carbonizing conditions, no increase in the yield of ammonia was obtained. The coal in the interval had fallen 2 to 3 per cent. in volatile matter; but I have concluded that not this but rather the changed composition of the coal ash was the explaining factor. The unwashed coal corbonized in the first case contained 0·158 per cent. of alkali chloride and 6·2 per cent. of total ash.

It is well known that most organic substances containing nitrogen when heated with soda-lime yield ammonia. This is in fact Will and Varrentap's method of estimating nitrogen. I am inclined to believe that the alkali chloride above, in conjunction with the lime in the coal, reacted in a similar way; and you will notice that, taking the 0·158 per cent. above as sodium chloride, the molecular equivalent of commercial sulphate of ammonia is over 4 lbs. per ton of coal.

The unwashed coal used about a year later was slightly altered by thermometamorphism; it having been mined from a position nearer to intrusive rock than that used about a year earlier. It contained about 4·5 per cent. of ash, and only 0·035 per cent. of alkali chloride. Dr. R. Lessing, in his lecture to the North British Association in 1914,‡ put the action of lime in the coal-liming process as probably catalytic; and he quoted the researches of Henderson and Beilby on the formation of nitrides by the absorption of ammonia by metals at elevated temperature, and the subsequent possibility of decomposing them by steam or hydrogen, as being explanatory of the action of the lime. While it is possible such nitride formation does take place, it can hardly explain the increase in yield of ammonia, since the reaction requires the previous existence of the ammonia. The intermediate nitride formation from nitrogen to which he referred, I think, is a more probable explanation. I quite agree with Dr. Lessing's view that the mineral matter present has a very important influence on the course of the reactions which occur in carbonization. The fact that fine crushing of the coal materially influences the yield of volatile products suggests that the thorough mixture of the mineral matter mechanically associated with the coal is an important factor; and published experiences with the coal-liming process bear this out.

On the evidence available regarding the production of ammonia in carbonizing practice, I think there is reason to anticipate that considerably higher yields can yet be obtained.

DISCUSSION.

Mr. Alex. Wilson (Glasgow), in opening the discussion, said Mr. Purves had the opportunity of making experiments and of taking observations which, in a general way, they did not have in their gas-works. As he had said, he carbonized practically one quality of coal for a considerable time, and in this way he could observe results for a lengthened period. The working of a gas-works did not allow these observations to be taken for lengthened periods, unless they placed some works under test conditions, which was not very easily done. They really tried to mix their coals as far as possible, because they found a mixture gave them the best results in gas yield, and also the best results in coke; but he could not say for ammonia. They could understand that, if they got a thorough mixture of their coals, then their work was going on under average conditions; and if their ovens were balanced to certain classes of coal, they were upset if they varied the mixture. Nowadays, without rhyme or reason, their makes went up and down; and he believed this was due to the coals coming in erratically. Sometimes they got a large delivery for some time from one firm, while other firms fell off. This uncertainty with regard to the kinds of coal delivered to them meant that a great many of their results were affected. At the coke-ovens, Mr. Purves was working under different conditions altogether, especially in view of the fact that he was working for one firm—a firm, as he understood, supplying him with the larger part of his coal. [The President: With the entire supply.] This enabled him to arrive at results which could be verified again and again. With reference to benzol extraction, they were all doing a little in this line at the present time. He thought that, even in smaller works, where they were carrying out tar-washing of the gas, they deserved gratitude for it. It entailed a great amount of worry, both for the manager and for the men. In one instance he could mention, the tar had to be pumped three times, and in some cases it had to be done by hand. They were doing this without extra pay, and were thus "doing their bit." He took the opportunity of thanking all those managers for the good help they were giving the Ministry of Munitions. Of course, in the larger works, where they were able to adopt the oil-washing process, they were getting better results; and he was glad to say that moderate works were also doing very well. However, they were only beginning the extraction of toluol and benzol on a practical scale. No doubt they would get better results. A great trouble was that mentioned by the President in his address—the naphthalene question. Like other works, they in Glasgow were finding a great deal of trouble with naphthalene. But they were fighting away; and he dared say that they would arrive at a method of working that would improve the position. He hoped this would be found very soon. Naphthalene caused not only a great deal of trouble to the department, but it worried the consumers. They did not understand the present position, and one did not like to explain it. But as soon as the position was put before a consumer, they found that he was very sympathetic. The points put forward by the President in his address would help them. No doubt the address would be read by other gas managers throughout the country who might find aid therein. With regard to ammonia recovery, he thought they were in the same position. They had really been gas makers; and most of their efforts had been expended in getting a good return from the coal in the gas-making account. In Mr. Purves's way of working the sulphate question was most important, and he was able to give it more exact and personal attention than they could give it. The good results he obtained were due to lengthy observation for considerable periods; and from these observations he believed they would all benefit in the future.

Mr. John Wilson (Falkirk) said that on the subject of tar-washing in the smaller gas-works, there was no reason why they should not go in for oil-washing as well.

The President: There is the cost of the plant.

Mr. Wilson said they required plant for tar-washing in any case, and the extra plant involved for the treatment of oil was not so very expensive. If they took such a system as that evolved by Mr. William Wilson, of Falkirk, he saw no reason why it should not be extended to smaller gas-works. About the irregular working of the purifiers in connection with direct ammonia recovery, might not this be due to the ammonia content in the gas being at one period at maximum and at another one absent altogether? He thought they had the ammonia problem pretty clearly in the temperature of carbonization. If they took the works which were content with a little yield of gas, with a temperature of something like 900° C., they got a very enhanced yield of sulphate; but for gas-works where they were getting the most they could out of the coal, the ammonia was falling off.

Mr. W. Bennett (Greenock) remarked that with tar-washing they would get some reduction in sulphur compounds. Of course, they also got a reduction with oil-washing. For purification purposes the oil-washing should be placed after the purifiers, in order to prevent oil-spray being carried forward to the purifiers—thus tending to cake them. They found this in the light oil carried forward at Greenock. [The President: That is fractionization and not spray.] In regard to Mr. Curphy's report on the direct-recovery practice, it must be remembered that in the direct process a larger amount of sulphuretted hydrogen and hydrocyanic acid and other impurities went forward to the purifiers than in the ordinary process, thus throwing more work on the purifiers; and the purifiers being of the same size, there was a larger rate of flow in proportion to the amount of impurities present. As a matter of fact, purification was largely a matter of rate of flow, temperature, and moisture content. With reference to the introduction of steam at the bottom of the vertical retorts, he instanced a recent Amsterdam experiment. The gas was increased from 12,700 cubic feet to 13,700 cubic feet per ton, with the calorific value practically the same. There was also an ammonia increase from 26·1 lbs. to 30·8 lbs. to the ton. In regard to bringing-down the temperature to 900° C., as Mr. Wilson suggested [Mr. Wilson: I did not suggest it], this would only be 1652° Fahr.; and he could not see that much gas would be made at that. He thought a temperature of 2000° or 2010° Fahr. was the lowest temperature at which they dared work in ordinary gas-works practice. It was interesting to know that Mr. Purves had discovered that there was a ratio between maximum ammonia production and the ratio of hydrogen to methane. He might remark that the presence of a large amount of alkaline chlorides would assist in the deterioration of the ironwork—it would increase the corrosion in the hydraulic mains.

Mr. D. T. Marwick (Dawsholm) contended that tar-washing was not worth bothering about. The whole fact was this, that if anybody after the war was going on with tar-washing, he did not

* See "Journal," Vol. CXXVI., p. 917.

† See "Journal of Chemical Society," 1910, (ii) 1917, and 1911, (i) 649.

‡ See "Journal," Vol. CXXVII., p. 570.

suppose the distillers were going to pay any more for it. Oil-washing was "the" thing. He might say that if the oil went in cold and the gas hot, it would take out naphthalene. The President might have given them a few figures about gas-works—as to the size of gas-works to which the oil-washing would apply. Could he give the amount of yield from the coal? In a fair-sized works, they must have a crude-benzol still to take off the 20 per cent. of creosote. If they had this, when it came on to the summer time it did not matter how much oil one was putting through the still, because the creosote was recovered. As to the kind of scrubber to be used, the best, he considered, was the Walker scrubber, which was on the rocking system. Large works, he affirmed, could not make light oil and keep this process going. As for naphthalene, it was not the amount of naphthalene in the gas that was now giving trouble, but the want of a carrier for it. This would, however, be remedied afterwards. They might have had ten times the amount of naphthalene before the oil-washing was used, and they would have had no naphthalene troubles, because the carriers were present. He found that steam was a great help in getting up the amount of ammonia per ton of coal. In one case, they obtained 35 lbs. with the use of steam in their verticals.

The PRESIDENT, in replying to the discussion, said he agreed with Mr. Alex. Wilson's views, that in working with one particular coal it was possible to arrive at more correct conclusions, and to get more consistent working results, than where several coals were mixed; and in direct ammonia recovery, on account of the fact that the ammonia sulphate was made from the gas immediately the gas was produced, it was possible to observe immediate changes in the yield and so make the necessary changes in the working conditions. Regarding Mr. John Wilson's remarks on oil-washing in smaller gas-works, his (the President's) sole point was that the cost of a complete crude-benzol plant was prohibitive. The question of what caused the irregular working of the purifiers was not under discussion. His only comment had been to indicate the possibility of an ammonia shortage at some periods, which Mr. Curphy queried. He agreed that a more moderate carbonizing temperature than that usually adopted in gas-works would lead to a large yield of ammonia. But this was not the whole solution of the problem of getting the maximum possible production; and any conditions established must be such as would not at all interfere with the financial returns. He certainly agreed with Mr. Bennett that one could have some reduction in sulphur compounds with tar-washing as well as with oil-washing; but oil-washing was superior. He also agreed with the additional point made by Mr. Bennett, that to avoid the oil-spray reaching the purifiers the benzol scrubbers should be after them; and he supported him in the statement that, in regard to the other impurities which passed to the purifiers in direct ammonia recovery practice, they had adverse effects on purification. He did not, however, think the volume of these impurities would alter the rate of flow to any material extent. In regard to the carbonizing temperature of 2000° Fahr. mentioned by Mr. Bennett, this was little above the oven wall temperature he (Mr. Purves) had given. But in speaking of the question of ammonia formation in the retort by the Tervet reaction, the temperatures he quoted related to the actual material being carbonized within the retort, which was considerably lower than the retort wall temperature. In regard to the ratio of hydrogen to methane, this applied solely to the one coal used, and to his working conditions. He did not see that the presence of alkaline chlorides in the coal could affect corrosion in the hydraulic main. Even if ammonium chloride formed (due to their presence), it would not normally cause corrosion, because corrosion was only set up when the ammonium chloride dissociated, which it would not do in an ammoniacal atmosphere. Where the temperature was sufficiently high to split ammonium chloride into its radicals, the gas was above its water dew-point; and dry hydrochloric acid gas did not corrode iron. Where there was contact with the atmosphere, however, dissociation and corrosion could take place; but this did not apply to the interior of any of the mains. Referring to Mr. Marwick's remarks, he might state that the fact that the oil was colder than the gas did not mean that it would take out naphthalene—it depended upon the degree of the naphthalene saturation of the oil. The condition of having the oil colder than the gas should be avoided, as it caused water to be deposited in the oil, which was very troublesome in working. The yield of oil from the coal depended on the nature of the coal and also on the carbonizing conditions; and it would probably be right to say that one would get from 2 gallons upwards of crude oil. It was quite satisfactory to make the light oil—say, 65 per cent.; and it was not at all necessary to redistil it for the recovery of the creosote. What Mr. Marwick had suggested was partial refining; and this was not a part of the crude plant. The whole question of reducing the oil in summer time was to effect a saving in steam—it had no relation to the content of creosote in the light oil. Mr. Marwick's preference for the Walker purifying machine was confirmation of his own view—that mechanical scrubbers were more suitable with varying gas production. He could not see anything to prevent large works making light oil. Mr. Marwick had said that it was the want of a carrier for the naphthalene that was causing present troubles. This was just the same as the ratio of naphthalene to condensible liquid hydrocarbons which he had stated.

A hearty vote of thanks was, before the close of the meeting, accorded to Mr. Purves for his address, on the motion of Mr. J. A. SMITH (Tradeston).

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Oil-Washing of Coal Gas.

SIR,—I have read with much interest the very able paper presented at the recent meeting of the Manchester District Institution of Gas Engineers by Messrs. P. D. Walmsley, B.Sc., and H. A. Morfey—particularly so as, at the works in which I am interested, a crude benzol recovery plant (steam-heated still) is now being erected. Provision is also being made for the installation later on of a rectification plant.

As the authors of the paper so frankly invited discussion, and so generously offered information, I venture to raise, through the medium of your columns, the question of the amount of water necessary for oil-cooling. The makers of our plant have mentioned 1000 gallons per hour; and as this amount appears such a high consumption, any particulars tending to reduce same would be greatly appreciated, and would doubtless prove interesting to other readers who have already erected, or contemplate erecting, recovery plants.

Again, I should be glad to know whether the steam consumption was actually obtained by some type of steam-meter—and, if so, what type; or was it a calculated figure?

Nov. 4, 1916. WATER.

Flat-Flame Burners for Use with Oil-Washed Gas.

SIR,—The question of the effect on the candle power of gas of oil-washing for the recovery of crude benzol naturally arose at the recent Wombwell meeting of the Manchester District Institution of Gas Engineers.

In view of the fact that there is some solicitude on the part of those proposing to adopt the oil-washing process, may I amend the report of a remark I offered on the subject which, as it stands, conveys a wrong impression? No one would suggest that oil-washing leaves the luminosity of gas unaffected. What I stated was that with a new burner that Messrs. Bray and Co. have introduced, consumers can get a flame with washed gas which is practically as good as that obtained from an ordinary "uncapped" burner working on 15-candle power gas.

One has to bear in mind that there are still many flat-flame burners which, in spite of all a gas undertaking may do, consumers will persist in using without economizer or like caps.

The new burner referred to is designed for 10-candle power gas; and it may be of interest to add that, judging by comparative tests on low-grade gas, it yields for the same consumption of gas more than 40 per cent. greater luminosity than a No. 4 burner fitted with a No. 7 economizer cap.

This possibility of improved efficiency in flat-flame burners should perhaps be known, since under certain conditions—and by some people—they are still likely to be required. Luminous flames are principally employed in passages, cellars, and the like; and systematic exchange of present for improved burners will materially help in overcoming this difficulty where oil-washed gas is supplied.

Doncaster, Nov. 4, 1916. ROBT. WATSON.

Exemption Applications.—With regard to a paragraph received from a correspondent and published on p. 244 of last week's issue, in which it was stated that at a sitting of the Darlington Tribunal the Military Representative objected to the Manager of the gas-works supporting a personal claim by one of the works employees, Mr. Frank P. Tarratt writes to say that he has not made an appeal for anyone in his department for several months past—and then not in support of an appeal on "personal" grounds.

Wages at Shipley.—The Shipley District Council have adopted the minutes of the Gas Committee, containing a decision to advance the wages of works mechanics in accordance with the official scale of the Engineers' Society. The Committee had deferred for a month an application by the Gas-Workers' Union for payment of time-and-a-quarter for overtime on week-days; the Clerk being instructed to obtain information as to what was done in other districts. At the same meeting of the Council the following resolution was passed: "That the salaries and wages of the Council's employees in receipt of not more than £2 per week at the outbreak of war be advanced 7s. per week, subject to deduction of any advances which have been granted since the outbreak of war; and that, where the salaries or wages exceed £2 per week, and where the appointments are held by juniors, or persons temporarily appointed to fill the position formerly held by employees who have joined the Colours, the circumstances be specially considered, and advances given which the Finance Committee consider equitable—provided that no advance be granted to any employee in receipt of £200 per year or over this amount.

Southampton Gas Company.—At the half-yearly meeting of the Company last week, the Chairman (Captain A. J. Corse Scott, J.P.) stated that the sales of gas for the six months under review showed an increase of 19 million cubic feet, or 4½ per cent., over the corresponding period of 1915. After payment of debenture interest and other charges, the amount available for the dividend on the ordinary stock was £18,749; and the Directors recommended that the maximum dividend, at the rate of 5 per cent. per annum, amounting to £16,193 for the half year, be paid (less income-tax), leaving a balance of £2555 to carry forward. Owing to the enormous increase in freight charges, through the requisitioning by the Admiralty of the boat chartered for the Company, as also the increased cost of oil, the Directors were compelled, from July 1, to further increase the price of gas. The total increase since the outbreak of war was 8d. per 1000 cubic feet; and, in all the circumstances, it might be called a normal one, as some of the leading Metropolitan and Suburban Companies, though they had not had to face such difficulties, had increased their price to the same extent. Upwards of sixty women were now employed in various departments; and arrangements were being made to train others for certain duties. The report was adopted.

REGISTER OF PATENTS.

Construction of Dry Gas-Meters.

ANDERSON, J., of Edinburgh.

No. 13,026; Sept. 11, 1915.

This invention relates specifically to the means for leading the gas into, and away from, the measuring chambers of dry gas-meters of the type in which parallel slide-valve seatings are arranged side by side. The object aimed at is so to improve the construction of the gas-ways that the capacity of the meter may be very materially increased and the cost of manufacture reduced.

The meter has its slide-valve seatings close together and with outlet ports connected together by a flat section channel formed of sheet metal; the gas-ways to the diaphragm chambers and to the meter exit being also formed of sheet metal parts arranged in the vicinity of the slide-valve seats.

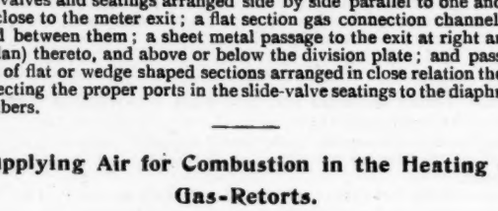
The invention also consists of a dry gas-meter with two reciprocating slide-valves and seatings arranged side by side parallel to one another and close to the meter exit; a flat section gas connection channel disposed between them; a sheet metal passage to the exit at right angles (in plan) thereto, and above or below the division plate; and passage-ways of flat or wedge shaped sections arranged in close relation thereto connecting the proper ports in the slide-valve seatings to the diaphragm chambers.

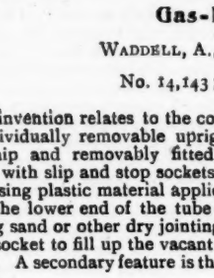
Supplying Air for Combustion in the Heating of Gas-Retorts.

WADDELL, A., of Dunfermline.

No. 14,143; Oct. 6, 1915.

This invention relates to the construction of a regenerator comprising individually removable upright tubes disposed in staggered relationship and removably fitted into upper and lower tube sheets formed with slip and stop sockets respectively. The tubes are jointed by pressing plastic material applied to the lower end of each tube between the lower end of the tube and the stop-end of the socket and running sand or other dry jointing material through perforations in the upper socket to fill up the vacant space and form a joint in the lower socket. A secondary feature is the formation of the tubes of polygonal section.





Waddell's Regenerator Arrangement

Figs. 1 and 2 are vertical sections at right angles to each other, and fig. 3 is a sectional plan of the regenerator. It comprises vertical tubes A of polygonal section—square or diamond—inserted in tube sheets B C fitted in a flue D adjacent to the upper end of the retort structure. This "constitutes a heat-exchanger for transference to the combustion-supporting air of part of the heat which would otherwise be conducted by the flue gases to the chimney."

In order that the tubes A may be readily accessible (and capable of convenient insertion, replacement, or renewal), a large number of individually removable tubes of small size and in single lengths are employed, held in the tube sheets without any permanent joint—being simply inserted in orifices of the sheets. A cover E is fitted above the upper tube-sheet so as to be readily removable; free space being left for inspection, removal, and renewal or replacement of the tubes or for the repair of the sheets constituting the interior walls or upper and lower floors of the regenerator. Columns F serve as supports for the tube sheets, and as baffles for diverting the flow of the flue gases.

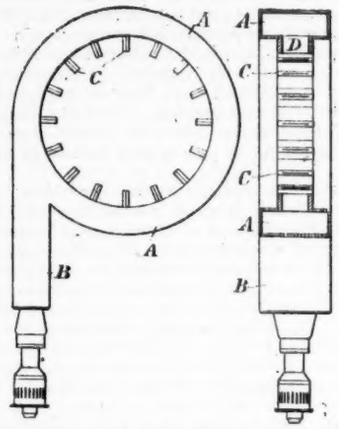
Before insertion, plastic jointing is applied to the lower end of each tube, which is then passed through a slip socket in the upper tube sheet and entered in a stop socket in the lower sheet—the jointing being pressed between the lower end of the tube and the stop end of the socket. Sand or other dry jointing material is then run through the perforations in the bottom of the upper socket, to fill the vacant space and form a joint in the lower socket.

Gas-Furnace Burner.

SOUTH METROPOLITAN GAS COMPANY and DEAN CHANDLER, of Old Kent Road, S.E.

No. 18,205; Dec. 31, 1915.

This gas-furnace consists of an annular atmospheric burner with a tangential mixing tube admitting air and gas preferably at high pressure. It has numerous nozzles directed radially inwards, so that the flames will approximately meet at the centre; and the nozzles are constructed with narrow slits of a depth which "will efficiently obviate any tendency to lighting-back, even when a highly combustible mixture is employed."



Chandler's (South Metropolitan Gas Company) Gas-Furnace Burner.

A plan or front view and a cross section of the burner are given.

A is the annular burner tube, having connected to it a tangential tube B fitted with the usual inlets for air and gas. C are flat burner nozzles projecting radially towards the centre of the ring. Gas and air, preferably at high pressure, enter the tube H and, circulating within the burner tube, find exit by the nozzles C, which contain narrow passages or slits D. When ignited the flames provide within the ring a heating zone into which articles to be heated may be introduced; and the flames, owing to the depth of the slits, will be unable to reach the combustible mixture within the tube A.

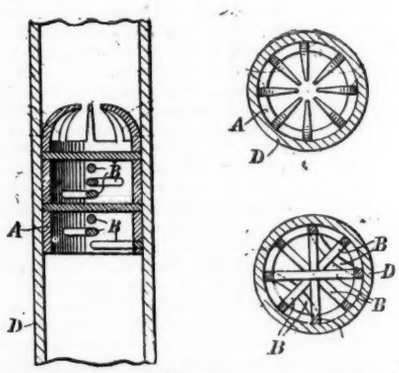
The breadth of the zone of flame may, it is remarked, be increased to any desired extent by multiplying the rings and placing them concentrically at suitable intervals or close together one behind the other.

Gas and Air Mixer for Incandescent Gas-Burners.—No. 101,654.

PRICE, A., and PRYSE, W., of Blackwood, Mon., and MORGAN, F. J., of Swansea.

No. 2409; Feb. 17, 1916.

This device for application to incandescent gas-burners for mixing the gas and air prior to combustion, has for its object "to impart a peculiar motion to the flow of gas and air that causes intimate admixture of same."



Price, Pryse, and Morgan's Incandescent Gas-Burner Tube.

The device is placed (as shown) in the pipe between the present gas and air inlets and the burner proper. On account of the greatly decreased quantity of gas required when the device is made use of, the patentees remark, due to the more efficient mixing of the gas and air, and in order to maintain the pressure of gas required to induce a sufficient flow of air for complete combustion, it will be found necessary to restrict the sizes of the holes in the gas-nozzles at present in use, by fitting them with a regulating shutter or the like. The device may be applied to either vertical or inverted burners.

The tube or cylinder A has its walls pierced with circular holes spaced in an irregular manner throughout its length, or they may take the form of a spiral—the object being that not more than one pair of holes shall be in the same plane. Round pins or rods B are fitted into the holes, and extend across the tube. The irregular arrangement of

the rods tends to "the more efficient mixing of the gas and air, and avoids any undue restriction of the cross sectional area of the tube." One end of the tube is furcated and the ends of the spikes thus formed are curved inwardly—a formation that is adopted in preference to bending straight across at right angles to the axis of the tube, so as to avoid undue restriction of the cross sectional area of the pipe.

Gas Manufacture.—Nos. 101,219 and 101,220.

RIEDEL, A., of Kossern, Saxony.

Nos. 11,574-75. Aug. 16, 1916. Convention date, Aug. 16, 1915.

The "Official Journal of Patents" for the 18th ult., published two brief abstracts of the specifications of the above numbered patents, which, although not yet accepted, are open to inspection under section 91 of the Act.

The first abstract is: In the manufacture of gas by the dry distillation of coal, the fixed nitrogen is converted into ammonium chloride by the addition of chlorides to the coal. The pipes leading from the retort are maintained at a temperature somewhat above 450° C. by insulation or by heat; and the temperature of the sublimation apparatus is kept below 450° C.

The second abstract is: In the manufacture of gas the activity of the water present in the material to be gasified, and of the steam or water introduced during the working of the apparatus, is increased by the addition of salts—such as sodium, calcium, or magnesium chloride, or the like—so that the water is fixed in the form of hydrates, and is only liberated at a very high temperature. By adding chlorides, the whole of the nitrogen present can be set free in the form of ammonium chloride, which can be separated by fractional distillation.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 1.]

Nos. 15,018—15,419.

AARTS, C. J. G.—"Process for oxidizing zinc sulphide, and application thereof in purifying gases containing ammonia and sulphuretted hydrogen." No. 15,260.

AKTIE BOLAGET INGENIÖRSFIRMA F. EGNELL.—"Gas analysis apparatus." No. 15,280.

ALLEN, E.—"Inverted burners." No. 15,389.

BROUCHER, D.—"Mechanical appliance for switching-off gas." No. 15,027.

BROUGHTON, J.—"Gas apparatus for lighting coal-fires." No. 15,214.

BROWN, J. H.—"Process of distillation, and still for same." No. 15,390.

CHAPPELL, R. A.—"Gas-heated boilers." No. 15,360.

GEAIRNS, A. D.—"Gas or coal fired kilns." No. 15,173.

HOLMAN, A. E.—"Attachment to facilitate turning gas-burners on and off." No. 15,112.

LONGSTAFF, T.—See Geairns. No. 15,173.

MUNDELL, A. R.—"Gas burners or lamps." No. 15,149.

SAUNDERS, S.—"Automatic controlling means for heating and lighting installations." No. 15,087.

SIMON-CARVES, LIMITED.—See Brown. No. 15,390.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Low-Temperature Carbonization of Coal.

Mr. FELL asked the Minister of Munitions if his attention has been directed to the question of carbonizing high volatile coal at low temperature and the benefits to be derived from it for the production of explosives, and the great saving of coal effected by the process; and if the Government engineers are following up the recent discoveries in this direction.

Dr. ADDISON: My attention has frequently been directed to the question of low-temperature carbonization of coal; and the subject is receiving close consideration. Its advantages from the explosives point of view are still problematical. My technical advisers are following up all the recent developments in this matter most carefully.

Mr. FELL: Is the hon. gentleman aware of the great increase in the use of this process in Germany, and that unless we are up and awake we shall find we are left as in some other things?

Dr. ADDISON: I am quite aware of all that; but I am also aware of the fact that the coke produced is of very little use to us.

LEGAL INTELLIGENCE.

"STILL" PATENTS FOR COKE-OVEN BYE-PRODUCTS.

German Methods of Obtaining Ammonia, Toluol, and Benzol.

Application was made in the Patents Court last Friday, by Messrs. Bagley, Mills, and Co., gas plant engineers, of Westminster, for a Board of Trade licence to adopt, and manufacture under, five Carl Still patents for plant for carbonizing coal to obtain coke, and such bye-products as ammonia, toluol, and benzol.

Mr. BLOXAM, in making the application, said the products mentioned were very important at the present time, because of the demand for them by the Ministry of Munitions. The patents were: No. 28,072 of 1912, for an improvement in the direct recovery of ammonia from the destructive treatment of coal, with a method of treating certain gases, which had their temperature reduced in passing up a central column (this was called a heat interchanger); No. 24,806 of 1911, for an improvement in coke-ovens; No. 3269 of 1911, for a reflex condenser; No. 22,863 of 1910, for a cooler for condensing mixtures of hydrocarbon; and No. 22,861 of 1910, for a mixing apparatus or stirrer for liquid. In regard to the heat interchanger, it was stated that an installation for fifty coke-ovens would cost £7000 or £8000; and the demand for this kind of plant was steadily increasing. The applicants before the war had an agreement with Carl Still, of Westphalia, by which they acted as sole selling agents for the United Kingdom, the Colonies, and the United States. The nature of the agreement was, broadly, that the agents had the sole right to supply materials and to erect plant. The agreement was in force prior to 1913. In that year, it was arranged that it should be extended to the year 1921; and subsequently an arrangement was made—though it was never reduced to writing—by which a company was to be established in this country on a profit-sharing basis, in which the capital was to be British and the applicants were to be the British representatives of the business. Messrs. Bagley, Mills, and Co. intended now to carry on the business. They were a substantial firm, and were receiving inquiries from clients for these appliances. Their position at the present time was that they could hardly give customers the necessary guarantees that they would not be interfered with by Carl Still after the war. To secure their position, Messrs. Bagley, Mills, and Co came to the Patents Court to obtain a Board of Trade licence to manufacture under these patents, and so protect themselves and their customers against eventualities when the war came to an end. Under these inventions there had been a certain importation from Germany before the war. The quotations had been submitted by Still; and on plant that was made in this country Still took a small profit. Messrs. Bagley, Mills, and Co. were paid a percentage. All the patents related to bye-products of coke-ovens. He suggested that a royalty on the erection of the whole coke-oven would be too heavy, and would not be justified, because—in one case, for example—the invention was merely an improvement in the construction of certain heating flues. The patents generally were landmarks in the progress of an industry which was continuously undergoing extension and improvement. He suggested that the fairer course would be to pay a royalty of 5 per cent. on the cost of making the patented parts.

The CONTROLLER (Mr. Temple Franks) said there was a difficulty in isolating the cost of particular sections. The Court preferred to have a royalty on the selling price of the whole installation. The patent made the value of the installation to the firm who installed it; and it brought the order. A royalty on the whole mechanism need not necessarily be 5 per cent.; it might be less. But it must be something that the Court could approve. He would go into the matter with Sir Cornelius Dalton, who sat beside him, and they would make their report to the Board of Trade. He would bear in mind what Mr. Bloxam had said; and they would decide which form of royalty was the fairer. The applicants would in due course hear from the Board of Trade as to the issue of their licence.

Dispute over a Gas-Engine Contract.

It was announced to Mr. Justice Avory and a Special Jury in the Liverpool Nisi Prius Court last Wednesday that the action by Messrs. Rowe Bros. and Co., Limited, of Liverpool, against Messrs. Crossley Bros., Limited, for rescission of contract, had been settled. The matter was referred to in the "JOURNAL" a fortnight ago [p. 193]; and it appears that the litigation had been going on for some years. Mr. Gordon Hewart, K.C., for Messrs. Crossley Bros., in informing his Lordship that the parties had come to terms, said that by consent there would be judgment for the defendants in the action without costs. Mr. Langdon would unreservedly withdraw all imputations. There were certain arbitration proceedings pending between the parties; and he was glad to say that all matters in difference between them had been amicably adjusted upon terms endorsed on Counsels' briefs. The defendants had met the plaintiffs in a fair business spirit. Mr. Langdon, K.C., said he unreservedly withdrew, on behalf of the plaintiffs, the allegation of fraud against the defendants. He recognized that it was vital that such a matter should be stated publicly; and he was very glad to be able to state it.

Infringement of a Trade Mark for Incandescent Mantles.

In the action of *Volker Lighting Corporation, Limited, v. Barnet Golombek* (trading as the Fairy Incandescent Company) application was made to Mr. Justice YOUNGER, in the Chancery Division of the High Court last Friday, for an injunction restraining defendant from selling, or passing off, incandescent mantles under the name of "Neptune," which was plaintiffs registered trade mark. Mr. Evan Jackson, for the plaintiffs, stated that their mark had been on the register for thirteen years; and the defendant, who had been selling mantles under the name of "Neptune," was willing to treat the motion as the trial of the action, and to submit to a perpetual injunction. The defendant, who appeared in person, said he was willing to put an end to the litigation, and urged that what he had done was through ignorance of the plaintiffs' mark being on the register. The offending labels were purchased by him from a traveller with other labels, which he was assured he was at liberty to use, and their use had not resulted in any profit to himself. In these circumstances, he submitted that he ought not to be called upon to pay the costs of the action, especially as he had been willing to submit without legal proceedings. His Lordship granted a perpetual injunction, and ordered defendant to pay the costs of the action; plaintiffs waiving the claim for an account of profits and damage, and agreeing not to advertise the order.

Messrs. John Yates and Co., Limited, of Birmingham, have appointed Mr. F. J. Winter, of 19-21, Wilson Street, Finsbury, E.C., to be London agent for their home-trade department.

MISCELLANEOUS NEWS.

CHELMSFORD GAS-WORKS PURCHASE.

Terms Agreed Upon.

Following the postponement, announced a fortnight ago, of the arbitration which had been arranged to take place to determine the price to be paid by the Chelmsford Corporation for the undertaking of the Gas Company, it is now stated that a figure (£86,056) has been agreed upon between the parties. The announcement was made at a special meeting of the Town Council last week—the Mayor (Alderman G. W. Taylor) presiding—in a report submitted by the Parliamentary Committee.

The report set out in detail the various negotiations, and recommended the Council to buy the undertaking on the following terms:

(*a*) The purchase price to be the sum of £86,056, which is equal to £104 for each £100 of stock issued by the Company, including the sum of £10,500 raised by the Company on mortgage or debentures.

(*b*) In all other respects the provisions of the Chelmsford Corporation Gas Act, 1915, so far as they relate to the purchase of the undertaking of the Company and the provisions of the heads of agreement of April 22, 1915, to remain in full force.

(*c*) The Council to pay the Company's taxed costs incurred in preparing for the arbitration.

(*d*) The Council to consent to the expenditure incurred by the Company on the erection of retorts, boundary walls and fence, and the provision of plant and apparatus for regulating the pressure of gas.

The Mayor said they would gather that the Parliamentary Committee and the Company had entered into a provisional agreement for the purchase of the gas-works. The present capital of the Company was £72,650, and the debentures £10,500, making a total of £83,150. There had been various negotiations with the Company from time to time; and they would remember that the Council offered £75,000 for the works. This offer was not accepted; and as the result of further negotiations, the Company asked the Corporation to pay for the works £88,236—including £10,500 for the debentures. If the Committee had agreed to this sum, it would have represented £107 for each £100 worth of share capital. The Committee did not think they would be justified in making such a proposition to the Council. After further negotiations, it was agreed, subject to the Council's approval, that the Corporation should pay £104 for every £100 worth of capital, and the debentures (£10,500) in addition, making a total of £86,056. The amount was not payable during the war, nor for twelve months afterwards, except with the consent of the Treasury; and, in the meantime, the Corporation, under the terms of their Act of Parliament, would have to pay to the Company 5 per cent. interest on the purchase-money. They would remember Mr. Stevenson estimated that the cost of the works would be £95,558; so there was a substantial difference in their favour. One great advantage which would accrue would be that in purchasing the works at the price he had mentioned, they would save from £1500 to £2000 in costs in avoiding arbitration in London, and also avoid the uncertainty of the amount of the award. He thought they could congratulate themselves upon being in the position to make an offer like this to the Company. The profits of the Company had risen considerably during the last two years, and last year were £7314. Mr. Stevenson had supplied them with figures for comparative purposes of awards in connection with arbitrations during the last ten years or so. These worked out as follows: At Pontefract, £1735 per million feet of gas sold; Prestatyn, £3080; Swinton and Mexborough, £1896; Sidmouth, £1651; while at Kirkcaldy the award amounted to £137,150, and the profit £6550. In all these cases except Kirkcaldy the quantity of gas sold was for the year previous to the arbitration. In the case of the Chelmsford Gas Company, the quantity of gas sold in 1915 was over 102 million feet; and the price the Committee proposed to offer, and which the Company were prepared to accept, worked out at £845 per million feet of gas sold. The Corporation would acquire the undertaking approximately at half the cost proportionately to that of any other undertaking bought by arbitration in recent years. The cost of compensation to officers of the Company was not considered in the figures he had mentioned. He thought they would agree with him they were making an offer that would be to the ultimate advantage of the whole town. He would like to add that Mr. A. S. Duffield (the Chairman of the Gas Company) had treated the Committee at all times with courtesy and consideration; and the Town Clerk (Mr. George Melvin) had been most assiduous in working out the figures and the details. The Gas Company had agreed to accept the offer of the Committee.

It was pointed out by Alderman F. Chancellor that, although they proposed to pay 5 per cent. on the purchase-money, from the moment that they began to pay this the Corporation took possession of the gas undertaking.

The report was unanimously adopted.

AUTOMATIC LIGHTING AND EXTINGUISHING OF STREET-LAMPS.

An Interesting Demonstration in Edinburgh.

Representatives of the Edinburgh and Leith Gas Commissioners and the Corporation of Edinburgh, with the Gas Engineer (Mr. Alexander Masterton) and other head officials, witnessed last Friday evening a demonstration of the Alder and Mackay pressure-wave system for auto-

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matically lighting and extinguishing public gas-lamps. Sixty-three lanterns in the Gorgie district of Edinburgh had been fitted up with the apparatus; and at a pre-arranged time a momentary increase of pressure (the makers recommend 12-10ths) at the governor controlling the district was made. From the vantage point of a bridge, from which about thirty lamps came within the range of vision, the company saw the almost simultaneous ignition of the burners, and were greatly impressed with the novel spectacle. Three of the lamps showed only a faint glimmer—the cause being due to the lighting-back of the burners through a faulty admixture of gas and air. After driving through the district, the party returned to the bridge and watched the extinguishing. Three of the lamps remained alight; but two of these, after a few minutes had passed, yielded to the wave, leaving one rebellious burner in splendid isolation. Doubtless a choked service-pipe, or some other easily remedied fault, accounted for the solitary failure. It was, of course, a very severe test, because the "pull" on the mains was at its maximum, which would tend to neutralize the effect of the extra pressure.

Thoroughly pleased with the demonstration, the company drove to the Commissioners' head offices, where Mr. John H. Bennet (a partner in the firm of Alder and Mackay) made an interesting speech. He stated that the system was in operation in 32 towns in England (including Newcastle-on-Tyne, Leeds, Darlington, Ipswich, Swansea, and Stockport), 27 in Scotland, 3 in Ireland (including Belfast), 17 in Australasia, 5 in France, and 3 in South America. As an illustration of the adaptability of the method, Mr. Bennet instanced Lurgan (Ireland), where five pressure-waves were employed—viz., (1) the lighting-up wave, (2) a wave to extinguish a portion of the lamps about midnight, (3) a wave to extinguish still more, but not all, (4) a wave to light-up, for the benefit of early workers, all lamps previously extinguished, and (5) a wave to put out the whole of the lamps—leaving them ready for simultaneous ignition in the evening. He also mentioned that in a small town in New Zealand there was some years ago keen competition between the gas company and the electric company for lighting the streets. The electric people boasted that they would be able to shut-off the light from their works at any time. Although the gas manager had never seen the "A. and M." controller, he had sufficient faith in the firm's description of it to undertake to light and extinguish the lamps automatically at any time that might be agreed upon. He secured the lighting contract; the controllers were installed; and they have been in successful use ever since.

At the conclusion of Mr. Bennet's remarks, the company adjourned to the luncheon-room, where light refreshments were served, and where the inventor of the apparatus (Mr. John Anderson) explained, with the aid of a lantern and single and duplex burners fitted with controllers, the construction and working of the mechanism, with which many readers of the "JOURNAL" are familiar. The apparatus may be described as a miniature gasholder, with a mercury seal instead of water. The increase in the pressure of gas causes the bell or dome to rise, and in doing so it works a ratchet-wheel which in turn exposes the orifice through which the gas passes to the burner, where it is ignited by the bye-pass. On the pressure becoming normal, the bell descends, without carrying the rack with it; and thus the burner remains lit. When it is desired to extinguish the lamps, the pressure is again raised, the dome ascends—moving the rack one tooth, the orifice is closed, and the light goes out; the bye-pass remaining "in" ready for the next lighting-up time.

The Convener of the Lighting Committee of the Corporation (Bailie Stark) said that the cost of the apparatus would work out at something like 27s. per lamp. Taking as a basis 6000 lamps—there were 10,500 in the city, which were far too many—he calculated that the automatic appliance would effect an annual saving of from £2500 to £3000. The economy would be almost entirely in wages. Bailie Stark gave some interesting figures as to the effect of the war on the cost of public gas lighting in the city. In the year 1913-14, the Corporation paid the Gas Commissioners for this service £8095; during 1914-15, £4825; and in 1915-16, £154. Thus the Commissioners had been large losers through adhering to old-fashioned methods of lighting and extinguishing the lamps; and they should therefore welcome a system which would bring them revenue.

Sir Robert Inches, who presided, expressed the hope that the automatic control of the gas-lamps would soon become an accomplished fact. He considered the device was both simple and effective; and it would certainly be a great boon to the inhabitants who lived in those parts of the city which were at present in darkness, owing to possible Zeppelin raids. The military authorities did not object to the gas-lamps being lit, but they did object to a long time being occupied in extinguishing them.

LEICESTER GAS-WORKS ACCOUNTS.

The half-yearly accounts of the Leicester Gas Committee were submitted at a meeting of the Council last Tuesday.

Mr. HILTON, dealing with the gas undertaking, said there had been a decrease in output of 27½ million cubic feet; but public lighting alone required over 26 million cubic feet less than was the case last year. It was also fair to assume that daylight saving had affected the output, and that otherwise a substantial increase would have been registered. The total receipts were £192,193, as compared with £169,075 in the corresponding period last year, an increase of £23,838. The expenditure was £145,780, an increase of £24,111; and the balance carried to profit and loss account was £47,133, a decrease, as compared with the corresponding half of last year, of £373 only. While the accounts for the first half of the year were so satisfactory, it was impossible to show equally satisfactory trade for the next half year. It was exceedingly difficult to forecast the year's result; but, so far as it was possible to judge, whatever surplus there might be would be very small. Several very difficult problems were before them, including coal and labour.

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Considerably more than 300 of their men had joined the forces in one capacity or another; and the allowances now being made to the dependants amounted to nearly £9500 annually.

Mr. MURBY said sufficient attention had not been paid to coal prices. They had been called upon to pay £22,000 more for coal and oil; and this should all come under the Limitation of Coal Prices Act. Yet they were in the position that, instead of tackling this question and attempting to get something done, the only suggestion made was that at some future time they would come and ask for a still further burden to be placed on the shoulders of the consumers. A conference of gas committees, companies, and engineers had been held on the subject, at which it was stated that no committee dare tackle the coalowners, for fear of getting no coal. Corporations dare not prosecute under the Coal Prices Limitation Act. The coalowners had to pay the excess profit tax and also income-tax; and it was suggested that the Government were taking 17s. out of every £1 obtained from the public in this way. If this were true, the Government were the culprits, and ought to be exposed.

Alderman SMITH said the *crux* of the matter was that the Government ought to take over the mines and nationalize them.

SOUTH BARRACAS GAS COMPANY, LIMITED.

Serious Coal and Other Difficulties.

The Twenty-Sixth Ordinary General Meeting of the South Barracas (Buenos Ayres) Gas and Coke Company was held last Thursday, at the Offices, No. 1, East India Avenue, E.C.—Mr. J. C. IM THURN (the Chairman) presiding.

The SECRETARY (Mr. W. Upton) having read the notice convening the meeting and the Auditors' certificate,

The CHAIRMAN proceeded to move the adoption of the report and accounts. He said that the result of the trading for 1915—the year under review—was a debit balance of £799; but adding the interest on loans and advances in London (£5976) made a total debit for the year of £6775, which, less the credit balance brought forward from 1914 of £932, left a net debit balance of £5843. The carrying-on of the Company during the year had caused constant anxiety to the Directors, owing to the effects of the war. Satisfactory reductions were made in the cost of gas manufacture, expenses of distribution, and in all other departments; but these, unfortunately, were more than off-set by the decrease in the gas receipts. As soon, however, as more normal conditions in this respect were resumed, the ground lost should be recovered. The situation was rendered even more difficult by the action taken by the Government here in prohibiting the exportation of English gas coal. Whatever might have been the necessity for this step, it had pressed with great severity upon the Company—depending upon this country, as they did, for coal supplies and for capital. The prohibition had a specially severe effect upon their Company, because they held a contract for a large supply of coal from South Yorkshire, at a very favourable rate, which they were not allowed to ship; and they were therefore compelled to look to the United States for supplies, obtainable only at enhanced prices. The contract to which he had referred was made after the war began, and became effective in the early part of 1915; and it would have secured all the coal the Company wanted until nearly the middle of this year, at quite a reasonable rate, had they been allowed to carry it out. Since the close of the year under review, the Directors had had the results of the working of the first six months of the present year, which, as was only to be expected, showed a further set-back, owing chiefly to stocks of coal left over from 1915 becoming exhausted, and supplies having to be obtained as and where possible at considerably increased prices. At one time, the Board felt compelled to agree to come under the scheme of the Coal Exporters' Committee of the Government, to obtain coal from the United States of America at a freight rate alone of no less than £4 5s. per ton, coupled with conditions as regarded rate of discharge and demurrage which were ruinous, if not impossible to the Company. As there was no help to be expected from the Government, in order to keep going, the Board were obliged to look for some other means of making gas; and after a series of experiments carried out by the Manager (Mr. R. B. Brown), they were successful in finding a particular kind of native wood which was capable of being carbonized in the coal-retorts and yielded a fair quantity of gas which could be used in conjunction with coal and oil. They were certainly greatly helped during the period of stress in 1915 and the early part of the present year, by gas oil bought locally by the Manager at quite a favourable price; and the shareholders could understand with what interest and anxiety the Board followed the experiments, and with what relief they learned of the solution to the problem, with its vital importance of keeping the works going, and so maintaining the goodwill of the consumers and the value of the business. During the year, residuals rose to an extremely high figure, which state of things still continued, though the price was always most irregular. But, unfortunately, they were not in a position to take advantage of the scarcity of fuel in the market, it being absolutely necessary to conserve every ton of coke that was made for use in the carburetted water-gas plant, without which it would have been impossible to solve their difficulties in the satisfactory way that had been so far done. The most important question the Board had to meet was not the loss of business in their district, because they believed this to be quite of a temporary character, but the maintenance of the gas supply, on which everything depended. The prohibition of the shipping of South Yorkshire coal still continued in force; and only with the greatest difficulty could a licence be obtained to ship North Country coal. When to this was added the difficulty of securing freight, the whole position became one that it was impossible to deal with at this end; and the Directors therefore had to instruct the Manager to obtain whatever coal he could in Buenos Ayres. That the Company continued to give satisfactory service throughout all these

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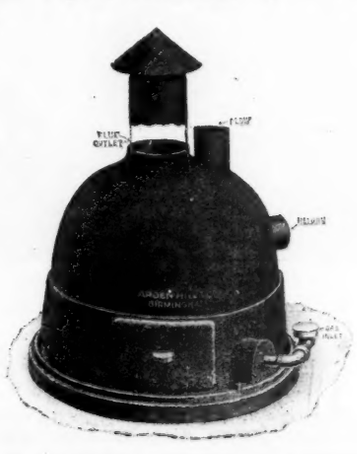

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difficulties was shown by the fact that at the end of 1915 there were 5003 meters in use, as against 5054 in 1914, when the war commenced; and they were assured by the Manager that the decrease in receipts due to the lessened consumption per consumer would be recovered on a return to normal conditions. The annual meeting had been delayed in the hope of more settled conditions allowing the Board to gauge the prospects better, and also because they were trying to arrange for permission to increase the price of gas as a temporary measure to compensate for the increased cost of coal, &c. Negotiations for this purpose had taken place with the two Municipalities in their district; but as the same point was already under discussion between the Buenos Ayres Gas Company and the Municipality there, the local Municipalities refused to move until the larger question had been first settled in the city. The accounts showed that the Company were heavily handicapped by the interest on the loans (now amounting to £82,724) raised from time to time to carry on the business. This interest for the past year amounted to the heavy sum of £5976; and the difficulty of meeting it had become much intensified owing to the war. Up to the end of 1915 the interest had been quite regularly met by remittances from the other side; but in view of the high prices which had now to be paid for gas-making material and the lessened receipts, the Manager had reported that he was not able to do more than about meet expenditure from income. Therefore, so long as the present conditions continued, he would not be able to forward the usual remittances. This being the case, it had been found impossible to meet the interest due on June 30, and a serious situation had arisen, which demanded early attention. The prohibition of the Treasury prevented the issue of new capital; and even were this not so, the prospects at present would not be encouraging for obtaining what was required on anything like reasonable terms. One thing, however, was certain, which was that the business of the Company must be preserved; and to do this money must be found for meeting at least the interest on loans secured upon debentures upon the Company's property. There was no doubt whatever that the shareholders themselves must find the necessary sum to pay this interest, and also provide some working capital to carry on the business. This must almost necessarily involve a complete reorganization of the Company. The Directors had been able to arrange for the sum required to pay the interest on the bank loan due on June 30 last, and also to meet the interest which would become due on Dec. 31. He had endeavoured to explain the position in which the Company had been placed by circumstances, and that the restrictions on getting coal had put them in an awkward position, because of the extreme importance of keeping up the supply of gas. Under all the adverse conditions, they considered they had done fairly well for the shareholders; but he must acknowledge that, had it not been for arrangements made in Buenos Ayres, and specially for the adaptability of the Manager, who eked-out his small coal supplies with substitutes, he did not know how the gas supply would have been maintained. At an early date, intimation would be sent out of what the Board recommended; and the shareholders would be called together in the early spring to consider the matter, and to decide the best way of raising the necessary funds.

The report was adopted; and in answer to questions, Mr. J. M. MACMORRAN said the proportions used for gas-making were one-third coal, one-third wood, and one-third oil. It was quite successful. Of course, the price of wood was very uncertain, though they made contracts as far as they could. The Primitiva Company were now using 7000 tons a month.

NOTES FROM SCOTLAND.

Retirement of the Lord Provost of Edinburgh.—At the meeting of the Edinburgh and Leith Commissioners on the 30th ult., affectionate farewell was taken of Sir Robert K. Inches, on his retirement from the position of Chairman. Sir Robert (then Mr.) Inches, joined the Commission in 1903, and was a few years later elected to the position of Convener of the Finance and Law Committee, an office which he filled with such ability and acceptance that he was, after three years, appointed Convener of the Works Committee. He had occupied the convenership for only twelve months when he received at the hands of the Town Council the highest honour they had it in their power to confer. He was elected Lord Provost of the City of Edinburgh, and so became, *ex officio*, Chairman of the Gas Commissioners. Sir Robert served the usual three years in the civic chair, and then agreed to continue in office for another year. The extended period of his provostship has now expired; and last Tuesday Lord Rosebery, on behalf of nearly a thousand subscribers, presented two portraits of Sir Robert, and an album containing the signatures of the subscribers. One portrait was presented to the Lord Provost's daughter, while the other is to be hung in the Council Chamber.

Wages Questions again Raised in Edinburgh.—The Edinburgh and Leith Gas Commissioners recently received a deputation, consisting of officials of the Edinburgh Branch of the National Union of Corporation Workers and nine of their own employees, who requested (1) that the wages of the meter-readers should be increased by 2s. per week; (2) that the pay of the other employees should be raised by ½d. per hour; (3) that double pay should be granted for all Sunday labour; (4) that overtime of all employees (including the staff) should count as time-and-a-half. The deputation further urged that an agreement should be come to whereby the wages question should be open for review in March and September during the war, and thereafter annually in September. The Commissioners gave instructions for particulars to be obtained of the rates of wages in the Gas Departments of Glasgow, Dundee, Aberdeen, and Paisley. At the Commissioners' meeting on Monday of last week, it was considered, after taking into account the superannuation, sick, and other benefits enjoyed by the men, that they were at present paid the standard rates. It was, however, agreed, if the men so desired, to make a reference to the Board of Trade arbitrator. At the same meeting, it was resolved to set aside

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650 cwt. and 350 cwt. of coke for distribution to the necessitous in Edinburgh and Leith respectively at 3d. per cwt.; the coke to be apportioned through recognized channels.

Forfar Corporation Gas Accounts.—The abstract of the accounts of the Forfar Town Council for the year ended May 15, shows that the revenue amounted to £13,531, and the expenditure to £10,988, leaving a balance to be carried to net revenue account of £2543. After meeting interest, sinking fund, and other charges, there remained a balance in hand at the end of the year of £1277, as compared with a sum of £896 brought into account. The quantity of coal carbonized was 6439 tons; the make of gas per ton being 9843 cubic feet. The quantity of gas accounted for was 58,162,900 cubic feet; the proportion unaccounted for being 7·66 per cent. The revenue from the sale of gas was £9160, and from residual products £4540. The price charged for gas was 3s 3d. per 1000 cubic feet.

Visit to the Greenock Gas-Works.—The Glasgow Corporation Gas Department Foremen's Association visited the Greenock Gas-Works on Saturday, the 28th ult. The party, which numbered about fifty, were met at the works by Mr. James M'Leod (the Manager) and the Convener of the Gas Committee (Dean Paterson). Subsequently the tour was made under the guidance of Mr. M'Leod and his assistants. The visitors were impressed by the compactness of the works, as it is almost possible to stand at the gates and follow the coal as it passes from one process to another in gas making. Naturally, much interest was manifested in the Woodall-Duckham vertical retorts, the operation of which was fully explained. On entering the show-rooms, the members were impressed by the decoration and design, and the attractive way in which the various appliances are laid out. The lighting is of the semi-indirect type. The model dining-room, bedroom, bathroom, and kitchen are so placed that the visitor cannot help being drawn within to get a better view of the equipment. Before visiting the show-rooms, Mr. M'Leod entertained the visitors at tea, and welcomed them to Greenock in the name of the Gas Convener and himself. Mr. D. S. Dobbie (President of the Association) and Mr. G. Scott suitably replied.

Burning of Coke.—Writing from the Dundee Technical College to the local "Advertiser," "J. S. L." gives information which he says will indicate wherein the burning of gas coke differs from the burning of coal. The coke, he proceeds, consists of combustible matter, ash, and a varying quantity of water. In burning gas coke, a high percentage of ash must be looked for; but the buying of water is not only foolish—its presence also hinders the proper burning of the fire. While the amount of heat to be got from a given weight of coke is less than from the same weight of coal, one would be quite willing to use it if dry, and if cheap enough. Why, he asks, is the coke not sold dry, and the price based on the heat value of the dry coke?

Lecture on Coal Residuals.—On Friday, the 13th ult., a lecture was delivered to the Glasgow Corporation Gas Department Foremen's Association by Mr. John Burns, who dealt with the development of the treatment of coal residuals. The lecture was illustrated by a varied assortment of such bye-products as are of commercial importance; the exhibits ranging from the various grades of light and heavy oils, creosotes, and chemical compounds, to a wide range of aniline dyes. The lecturer, after commenting on the present position in regard to residuals in British manufacture, instanced the encouragement given to chemical research in Germany, and said that, if real progress was to be made in this country, greater facilities would have to be provided, either nationally or by the municipalities, for education and research. He urged the extension of the principle of technical schools, the formation of suggestion bureaus for employees in the gas industry, and the more general entry of the municipality as such into the field of production, so far as the bye-products were concerned.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 6.

The position of pitch is steady, and fair business is reported as having been done at 21s. per ton net, in bulk, at makers' works. There is more demand for creosote, and to-day's value is about 4d. per gallon net and naked at works. In other products, there is no particular change to record.

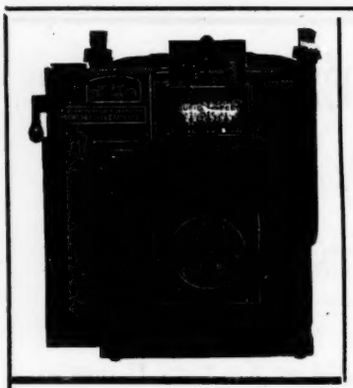
For export, 25 per cent. sulphate of ammonia continues steady at £17 12s. 6d. per ton net into buyers' bags at sellers' works, and it is reported that £17 15s. has been paid for forward delivery.

Tar Products in the Provinces.

Nov. 6.

There is nothing fresh to report concerning the market for tar products. Business is still very difficult in pitch. Solvent naphtha is quiet; but there is no alteration in price. The improvement reported in creosote last week has been maintained.

The average values of gas-works products during the past week were: Gas-works coal tar, 17s. to 21s. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6⅝d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅛d. to 2⅜d. Heavy oils, in bulk, North, 3⅛d. to 3½d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2¾d. per unit; "B," ¾d. to 1d.



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Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Nov.* 3.

Throughout the week the market has continued firm; but there has not been any further advance in values. The demand from neutral countries has been good; but the accumulation of arrears of shipments has prevented much new business being booked. The closing quotations are unchanged at £17 17s. 6d. per ton f.o.b. Hull, £18 f.o.b. Liverpool, and £18 2s. 6d. f.o b. Leith. The volume of trade in the forward position has again been restricted; but it has transpired that further sales have been made for delivery in the first half of next year at an increase of about 5s. per ton on prompt prices.

Nitrate of Soda.

There is no alteration in the tone of this market, and quotations are repeated at 17s. 7½d. per cwt. for ordinary quality and 18s. 1½d. for refined, on spot.

Sulphate of Ammonia.

From another source it is stated that to-day's quotations are as follows: Outside London makes, £16 15s.; Hull, £17 12s. 6d.; Leith, £17 17s. 6d.; Liverpool, £17 15s.; Middlesbrough, £17 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is dull through lack of steamships to take away fuel, especially steam coal, of which so large a proportion of the production is usualiy sent abroad. With British ships commandeered so greatly, there is a scarcity of vessels to an extent that has now a very serious effect on the collieries that most depend on the export trade. In the steam coal trade, the shipments are very full at this season generally; but now they are dull, and prices are influenced greatly. Best Northumbrian steams are quoted at 28s. to 30s. per ton f.o.b.; second-class steams are 25s. 6d. per ton; and steam smalls from 17s. 6d. to 22s. per ton, according to quality. The prices, however, are largely nominal; real sales being few, and contracts that are running are often higher. But delivery is delayed owing to the cause named; so that the collieries have not large quantities free for sale, if there were tonnage at hand to meet the amounts sold already. In the gas coal trade, there is also a lack of steamers; but the growth of the local demand enables the collieries to keep going, though it is in some cases with difficulty, and in such instances prices may be lower than the market quotations. Best Durham gas coals are from 27s. 6d. to 28s. 6d. per ton f.o.b.; for second-class gas coals the quotation is about 20s. to 21s.; and for "Wear Specials" about 30s. is quoted. A further rise of 5 per cent. in the wages of the Durham miners should stiffen gas coal when the shipping supply is a little more adequate. This factor has influenced freights; for though the rates in the controlled trades are unaltered, in others they are firmer. In the coasting trades, as much as 14s. has been paid for freights on gas coal, Tyne to London. Coke is steady. The output of gas coke is heavier; but the price is unaltered. For good quality, the quotation is from 34s. to 35s. f.o.b. in the Tyne. Coke freights to France continue high.

The Turbarite Syndicate has been registered with a capital of £15, in 300 shares of 1s., to acquire patents, inventions, and concessions relating to the utilization by distillation, masceration, or other means, of peat, wood, refuse coal, cannel, shale, asphalte, or other carbonaceous material, &c. There is an agreement with W. L. St. J. Prioleau, J. R. H. Prioleau, and J. W. Johnston.

Leicester Wages Advances.—The following increases in wages have been given to Leicester gas workers: Stove assemblers, ½d. per hour; pitch loaders, 10 per cent. on piece-work; to all men receiving 6½d. per hour, ½d. per hour; carters, 1s. per week; wheelwrights, 2s. per week; all shift men, 4d. per shift; and £10 per annum to those employees receiving from £150 to £170 per annum, both inclusive. The Arbitrator appointed to consider the question of pay to the gas employees for Sunday work, in his award, says he finds that the present arrangement in Leicester as regards hours of work and rate of pay to shift men for Sunday work is reasonable and proper; and he awards accordingly that no alteration be made therein.

Blackburn Gas-Works Improvement Scheme—Intimation has been received by the Blackburn Town Council from the Local Government Board that the Treasury are not prepared to sanction the raising of a proposed loan of £74,568 for the improvement and extension of the Greenbank Gas-Works; but they will sanction the sum of £5000 required for a tar distillation plant. In these circumstances, the Board say that, "while satisfied that the proposals are desirable and generally satisfactory," they are not in a position to accede to the Council's request. Thus the scheme of the Gas Engineer (Mr. A. Morton Fyffe), which was detailed on p. 177 of the "JOURNAL" for July 25 last, will perforce have to be indefinitely postponed.

Discharged Soldiers as Meter Inspectors.—The Gas Committee were asked by Mr. Frith, at a meeting of the Oldham Town Council, whether they had engaged, more female meter inspectors. He suggested that employment in this work should be found for discharged soldiers. They should be found work; and it must be light work, such as meter inspection. Alderman H. Wilde (the Chairman of the Gas Committee) replied that this was being done. At present thirteen meter inspectors were engaged, who had taken the places left vacant by employees who had gone to the war. Whether the proportion was six women and seven discharged soldiers, or seven women and six men, he was not sure. The Committee had, however, given every consideration to the question of employment for discharged soldiers. Not only had they been taken on as meter inspectors, but one or two other places had also been found for them.

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Sheffield Calorific Standard Inquiry.

Unfortunately, in the hurry of preparing the matter for the printers, a few inaccuracies found their way into the report that appeared last week [p. 249-251] of the inquiry which took place at the offices of the Board of Trade relative to the application of the Sheffield United Gas-light Company for an Order under the Calorific Power Standard Act. Mr. Hanbury Thomas, the Managing Director of the Company, was reported as saying that the price of gas had reached 2s. 9d. per 1000 cubic feet after he joined the Company; whereas really the reference to 2s. 9d. was that this was the highest price at which the Company could pay their 10 per cent. dividend. As regards calorific value, he did not give any figures as to the calorific value of the gas supplied by the Sheffield Company. The reference to 490 B.Th.U. was in connection with Leeds. Mr. Hanbury Thomas stated that the "Gas-Works Directory" gave the Leeds calorific power for the year ended March 31, 1915, as 490 B.Th.U.

Darlington Gas-Works Accounts.

The accounts and statistics of the Darlington Corporation Gas-Works for the year ended March 31, which have been prepared by the Gas Engineer (Mr. Frank P. Tarratt) and the Borough Accountant (Mr. J. W. Armitage), show that the income on revenue account was £74,452, and the expenditure £56,626, leaving £17,826 to be transferred to profit and loss account. The sale of 396,778,124 cubic feet of gas realized £52,265; while the return from residuals was £19,192. After meeting interest and sinking fund charges, and transferring in aid of the rates £4000, the proportion of profit for the year to March, 1915, there was a balance of net profit in hand at March 31 last of £9281. The quantity of coal carbonized in the twelve months was 35,446 tons, and of gas made 428,007,000 cubic feet, or 12,074 feet per ton. Of the gas sold, 99·77 per cent. was to private consumers. The proportion unaccounted for was 5·95 per cent. of the make. At March 31, there were 15,320 consumers (8307 of them on the prepayment system), and the total length of mains was 75¼ miles.

Care of "T.N.T." Workers.

At an inquest last week on the body of a young woman who died in hospital after being taken ill in a North Midlands munition works, the Staff Superintendent gave some details of the precautions being taken to care for the health of the workers. The deceased had been employed in the melt-house on an eight-hour shift, one hour in the middle being allowed for meals and recreation. She would wear gloves and a respirator. The atmosphere was charged with fumes which it was undesirable to inhale; but it was in contemplation to make a new arrangement whereby the workpeople would not be so long in a certain atmosphere. There was a hospital on the premises, equipped, and having trained nurses; and there was a permanent medical officer and two visiting medical officers. The girls were also made to take a hot bath every week in the employers' time. Before having a meal, they were shut up in a charge-room for a quarter-of-an-hour, so as to ensure that they would wash; and this time was paid for. The authorities also, coming to the conclusion that while a man would always feed himself, a woman would not, were now deducting 10d. a day from their wages, in return for which they got two square meals and as much hot milk as they could drink. The idea was that, having paid for the food, they would eat it. Further, there was a dentist, who gave attention free of charge. A post-mortem examination revealed acute yellow atrophy of the liver, the result of "T.N.T." poisoning.

Louth Gas Company.—At the annual meeting of the Company, it was reported that the net profits for the year amounted to £1947; and the Company have been able, without increasing the price of gas, to maintain the statutory dividends. While gas-rentals show a decrease of about £200, receipts from residuals have increased by more than £500 on the year. The balance of £2907 was appropriated, as to £1786 to dividends, with a sum of £1121 carried forward.

Fatal Acetylene Explosion.—Evidence given at a Coroner's inquest at Chipping, near Preston, showed that last Wednesday evening the village schoolmaster (Mr. Henry Hoyle), who had an acetylene gas plant in an outhouse near his residence, went to inspect the apparatus, and struck a match. An explosion immediately occurred, completely wrecking the building, and killing Mr. Hoyle. It seems the gas plant had been in a defective state for some days. The Jury returned a verdict of "Accidental death."

Chepstow Water Supply.—The Chepstow Urban District Council have been notified of the intention of the Water Company to apply for a Provisional Order to extend and define their limits of supply to include outside parishes, to authorize the construction of new water-works, the acquisition of lands and easements, the raising of additional capital, and to alter charges. The Chairman (Mr. Lawrence) said he thought the supply to the town should be guaranteed. The Council considered the matter in committee.

Deptford Public Lighting.—The Deptford Borough Council have considered a letter from the South Metropolitan Gas Company, stating that they have perfected an inverted burner which will give an illuminating power equal to 50 candles at a consumption of 2 cubic feet of gas per hour, and adding that if the Council adopt these burners in lieu of those at present fitted in the lanterns along the main roads, a saving will be effected of £1 2s. 5d. per burner per annum, against which the cost of installing the inverted burner would be 6s. per lantern. The Company further state that, when normal lighting is resumed, they will refix the old burners without cost to the Council. The approximate number of burners to be converted is 560, which would cost £168, while the saving would be £459 per annum. Being of opinion that the adoption of the smaller burner will be quite adequate for lighting purposes, and that it will effect a considerable saving in the consumption of gas, which under existing arrangements is being burned to waste, the Council have given instructions for the lamps in the main roads to be converted.

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Kingsbury and the Calorific Standard Question.—The Kingsbury District Council have agreed to forward to the Board of Trade objections to the Harrow and Stanmore Gas Company's application under the Gas (Standard of Calorific Power) Act, 1916. The objections were framed at a conference of local authorities held at Harrow.

Richmond Gas-Works Extensions.—At the meeting of the Richmond (Yorks.) Town Council, the Gas Committee recommended that they be authorized to provide additional plant at an estimated cost of £750. Alderman Whitton explained that the Committee had decided to again contribute £500 in reduction of the rates, so that the £750 they asked for was really money which the department had put away for work of this description. During the year, they had sold 4,000,000 cubic feet of gas more than last year; and the figures constituted a record. The new plant would pay for itself in the course of a few years. The recommendation was carried.

Demand for Gas-Cookers at Elland.—At the Elland Tribunal, Mr. Robert Porter (the Manager to the local Gas Company) applied for exemption for Frank Foster, stoker, and William Bumstead, fitter. Mr. Porter said his Company were in a real difficulty on account of the great request for gas-cookers. The war had altered the demand for gas in the out-districts, where the advantages of the gas-cooker were only now fully realized by the public. There were at the present time forty cookers waiting to be fixed. Foster was declared to be in a certified occupation. The Tribunal refused the appeal for Bumstead; but he is not to be called up before Dec. 31.

Appeal for a Gas Stoker Refused.—At a sitting of the Colchester section of the Essex Appeal Tribunal, the Braintree Gas Company appealed for a stoker, aged 23, and single, on the ground that he was necessary for the supply of gas to the town and munition works. The Local Tribunal had ruled that any moderately intelligent man could soon learn to take this one's place; while the Labour Bureau said they had offered a suitable man to the Company, but they refused to employ him. For the Company, however, it was said that the man who was sent could not, and would not, do the work. The appeal was dismissed. Mr. Hills (who appeared for the Company) asked leave to appeal to the Central Tribunal. The Chairman (Dr. W. H. Slimon, J.P.) said that here was a man who was supposed to be quite indispensable getting 6d. per hour. He could not be indispensable, or he would have a better wage. Leave to appeal was refused.

The accounts of the Leicester Corporation water undertaking for the half year to June last showed a deficiency of £11,835.

Among the companies whose names have been struck off the register and the companies dissolved are: Atkins Filter Engineering and Water Softening Company, Blanchard Lamp (Foreign Patents) Company, and Reliance Incandescent Company.

The new Morecambe Gas Engineer (Mr. R. H. Ruthven) has urged the installation of mechanical stoking at the works, and has produced a scheme and estimate. The Committee have arranged for a visit to the Lancaster and Hindley Gas-Works to inspect machinery there.

There will be a meeting of the Midland Junior Gas Association next Saturday afternoon, at the Birmingham Technical School, when Mr. E. P. Taudevin (head of the Furnace Department of the Richmond Gas Stove and Meter Company, Limited) will lecture on "Gas-Furnaces for Present-Day Industry."

The Scottish Junior Gas Association (Eastern District) will next Saturday visit the Kirkcaldy Gas-Works. Afterwards the members will meet at the Masonic Hall, when Mr. Campbell, the Manager of the Kinross Gas-Works, will read a paper entitled "Erection of Retort-Bench and Drainage Difficulties."

The coal-bunkers at the Dunfermline Gas-Works are constructed of reinforced concrete on the Kahn system; the design having been prepared by the Trussed Concrete Steel Company, Limited. This style of construction, besides giving great strength, is weather-resisting; and the buildings are stated to be erected economically, representing a saving of money over the customary method.

The dead body of a Primitive Methodist minister of Brentwood was found last Saturday week in his church; death having been due to gas poisoning. On the previous day, he had arranged to do some work at the church, and then go on to another town. As he did not return, inquiries were made; and he was found lying beside a gas-bracket which it was thought he had been attending to when he was overcome by gas.

With the primary object of furnishing a convenient means of identifying and ordering replacement parts of the best-known gas cookers, fires, radiators, and circulators manufactured by them, the Davis Gas-Stove Company, Limited, have compiled a "Handbook of Parts." The book is one that must prove of the greatest service to storekeepers and maintenance men who have the handling of Davis specialities; but, in addition to this, the firm say they feel that the illustrations, with their keys, constitute an imposing argument for standardization and interchangeability, which has long been a cardinal feature of their manufacturing policy.

For the first time since gas was introduced into Grahamstown, twenty-one years ago, a series of demonstrations of how to cook with pleasure and ease by means of a gas-stove was given in the Shaw Hall early last month. The hall itself was lighted by the latest type of burners, giving a brilliant light, with artistic effects secured by coloured shades. Miss W. M. Currey, of the staff of the School of Domestic Science, Cape Town, was the demonstrator; and she had keen and large audiences. The enterprise of the South African Lighting Association and of Mr. William Arnott (the General Manager), in arranging the lectures, was much appreciated. Councillor Knight, also, at the opening ceremony, commented upon the able manner in which the Association and their officers had served the town.

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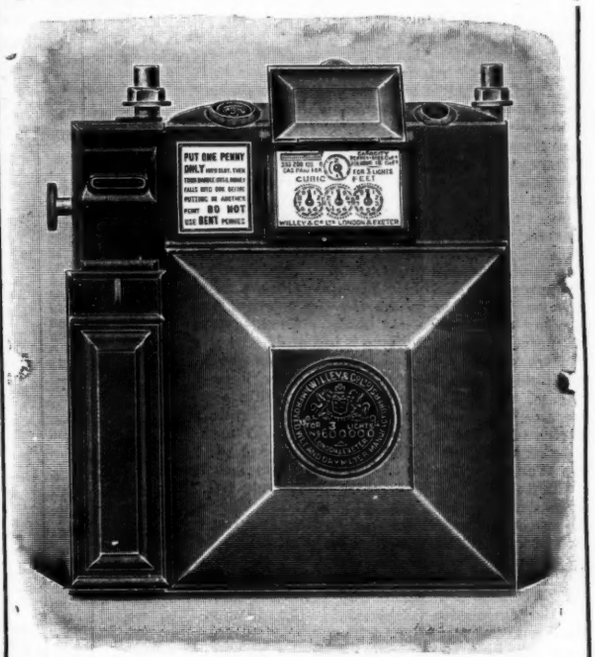

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STOCK MARKET REPORT.

THE Stock Exchange has had a much better week. The start on Monday was promising, and the tone steadily improved until at the close it was really quite cheerful. Business for the full week of six days was resumed, and, amid the prevailing good humour, protests against the reopening on Saturday were unheard.

Among the factors which operated to produce the favourable tendency was the good war news, especially the improved position in Roumania. But perhaps the chief source of satisfaction was indicated by the persistent talk of an early issue of a new War Loan. Seekers after investments are not content with the Exchequer Bonds and Treasury Bills with which they have been fed up; they desire the greater fixity of longer dated securities. The talk even got so far as formulating details of the new issue; but here, again, we had better "wait and see." Perhaps it is not far off, and certainly the conversion of the 4½ per cent. loan would be welcome.

The gilt-edged market was in fine form. The War Loan was in great demand, and, as holders sat tight, the prices went up by strides. Consols also did well. Home Rails were somewhat mixed, and Americans quite out of it.

In the Foreign Market, France had the front place. The new loan at once commanded a premium, and it and the old loan continued to rise hand in hand. Other State loans were little noticed. South Africans were fairly firm. In the Miscellaneous Market there were fluctuations; but rubber, textiles, meat concerns, and armaments were among the best.

Business in the Gas Market was even quieter than the week before. Few issues were dealt in at all, and some of these had only a solitary bargain in them. The tendency was not strong generally, and one of the two issues had a slight reduction in price. The Monte Video Company will pay an interim dividend of 6s. per share, less tax, on the 1st prox.—the same as last year.

In the Money Market, there was a fair demand early in the week; but the position relaxed materially before the close. Among topics of general interest, strong dissatisfaction is expressed in highly influential quarters with the snail's pace at which the Government are dealing with the German banks. An extension of the mobilization scheme is in hand.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 75¼, 76, 76¼, 76⅛, ditto maximum 57, ditto preference 69, ditto debenture 59⅜, 60, Primitiva preference 67s. 6d., South African £6 14s., £6 14s. 6d., South Metropolitan 83, 83½, 84. On Tuesday, Brentford "B" 83, Gas Light ordinary 76, 76⅛, 76⅜, ditto preference 69½, Primitiva 40s. 7½d., 41s. 3d., 42s. 6d., South Metropolitan 84½. On Wednesday, the London Stock Exchange was closed. On Thursday, Brentford "A" 86, 86½, ditto "B" 84, Commercial 4 per cent. 73, Gas Light ordinary 75, 76, ditto preference 70, Primitiva 40s., South Metropolitan 83½, 83⅞. On Friday, European 12⅜, 12¾, Gas Light ordinary 75, 75⅜, 76, ditto preference 69, 69½, 69⅜, Primitiva 40s., South Metropolitan 84, 84⅜. On Saturday, Bombay 5⅛, British 34½, 34⅜. Continental Union 36½, Gas Light preference 69⅜, Primitiva 40s., ditto preference 65s., South Metropolitan 83⅜, South Suburban 81, 81½.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 28, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅜	4⅞—5⅜*	5½
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	29—30	26—27	..
388,110	10	,,	7	7/-	B ¶ p.c.	15—15½	11—11½	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9½—10	..
159,740	—	—	—	4%	4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consold.	261—266	86—88	86—86½
734,920	,,	,,	†11	53/9	Do. B New	204—209	83—85	83—84
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—98	..	..
217,880	Stk.	Feb. 26	11	10⅛%	Brighton & Hove Orig.	208—213	165—168	..
244,200	,,	,,	8	7⅜%	Do. A Ord. Stk.	154—159	121—124	..
530,000	20	Mar. 26	12½	22/6	British	44—45	34—35	34¼—34⅜
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
245,771	Stk.	June 26	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1½—1⅝	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	85—86	..
1,518,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	73
660,000	,,	,,	5½	46/8	Do. 3½ p.c. do.	108—105	68—70	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	..
800 000	Stk.	,,	4	—	Continental Union, Ltd.	76—79	36—38	36½
200 000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	55—57	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅞%	Derby Con. Stk.	123—126	100—105	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,009,180	10	July 29	10	7/6	European, Ltd.	17⅞—18	12½—13½	12⅝—12⅞
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas and Coke Light { 4 p.c. Ord.	98—102	75—77	75—76⅛
2,600,000	,,	,,	3½	3⅜%	3½ p.c. max.	76—79	55—58	57
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	69—71	69—70
4,674,850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	59—61	59½—60
180,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
258,740	Stk.	Mar. 12	5	4⅜%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	8—9	..
86,600	—	—	—	9⅛%	Hornsey 7 p.c.	..	125—135	..
181,000	Stk.	Mar. 12	7½	7⅛%	Ilford A and C	151—154	112—117	..
65,780	,,	,,	6¾	5¾%	Do. B	115—119	103—108	..
55,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	73—76	..
4,940,000	Stk.	May 14	9	4½%	Imperial Continental	150—160	85 90	..
1,235,000	Stk.	Feb. 12	3½	3⅛%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,342	Stk.	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,905	Stk.	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	87—88	..
					{ B	146—148		
306,089	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	76½—78½	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	4—4½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—93	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8⅞—9½	..
1,875,892	Stk.	July 29	4½	4½%	Newc'tle&G'esh'd Con.	98½—99½	79½—80½	..
529,705	Stk.	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—88	75—77	..
55,940	10	Feb. 26	7/14/0	7/6⅜	North Middlesex 7 p.c.	14—15	10½—11½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	108—110	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	..
60,000	50	Feb. 26	13	13%	Portsea, Island B	138—131	95—100	..
100,000	50	,,	12	11%	Do. C	118—121	88—93	..
53,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	2 -5⅛	40/—42/6
499,960	5	June 26	5	2/6	,, 5 p.c. Pref.	4⅜—5	3½- 3⅞	65/—67/6
621,600	100	June 2	4	4%	,, 4 p.c. Deb.	91—93	80—82	..
—	—	—	—	4%	,, ,, ,, 1911	..	..	..
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	63—68	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	8—8½	..
135,000	50	July 1	5	5%	{ 5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	228—234	188—192	..
209,984	,,	,,	10	10%	Do. B	228—234	188—192	..
233,500	,,	,,	10	10%	Do. C	228—232	188—192	..
90,000	10	May 28	9	6/-	South African	10½—11½	..	6/14/- 6/14/6
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85	t3—24⅜
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	59—61	..
224,830	Stk.	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	145—147	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	81—81½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	79—81	..
135,000	—	—	—	48/4	Do. West Kents.	..	..	..
187,558	,,	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	90—92	..
647,740	Stk.	May 14	5	5%	Southampton Ord.	99—102	90—95	..
130,000	Stk.	Feb. 12	7½	7⅛%	Tottenham { A 5 p.c.	135—138	120—123	..
783,275	,,	,,	6	5⅝%	District { B 3½ p.c.	116—117	90—92	..
181,355	,,	June 26	4	4%	{ 4 p.c. Deb.	87—89	73—75	..
183,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	4⅞%	Tynemouth, 5 p.c. max.	108½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅝	78/9	Wandsworth A 5 p.c.	151—156	117—122	..
255,636	,,	,,	6⅞	63/9	,, B 3½ p.c.	129—134	101—103	..
108,075	,,	,,	5/17/3	55/1½	,, C 3½ p.c.	110—115	88—93	..
359,000	,,	,,	6¼	57/6	Wimbledon 5 p.c.	117—122	93—95	..
98,000	,,	,,	6⅝	63/9	Epsom 5 p.c.	121—126	98—103	..
98,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	53—56	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

CHARGE OF SUCTION GAS, &c., PLANT, &c. Oxford Cold Storage and Ice Company.

WORKS CHEMIST. No. 6237.

MANAGER (SMALL WORKS). No. 6238.

MANAGER. Holmfirth Gaslight Company. Applications by Nov. 18.

Appointment Wanted.

GAS FITTER with Knowledge of Meter-Rents, &c. No. 6240.

Plant, &c. (Second-Hand) For Sale.

BOILER TANK, STEAM WAGGONS, TRACTION, &c. Stanley Engineering Company, Bath.

PIPES, &c. No. 6235.

CORNISH BOILER. Abertillery Gas and Electricity Department.

GASHOLDERS. Shropshire Union Railways and Canal Company, Birmingham.

EXHAUSTER ENGINES. Bath Gaslight Company.

PIPES AND CONNECTIONS. Blackburn Gas Department.

Second Hand Plant, &c., Wanted.

GASHOLDERS. No. 6239.

PRODUCERS. Talk o' th' Hill Colliery Company.

Wanted to Hire (or Purchase).

ACID TANK WAGGONS. Walker and Wallsend Gas Company.

Wanted to Purchase.

CARBON. No. 6192.

Meeting.

ORIENTAL GAS COMPANY.—Finsbury House, E.C. Nov. 22. Twelve o'clock.

BOOKS AND LEAFLETS

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TO comply with Regulation 8 (*b*) of the above Act, advertisements from firms whose business consists wholly or mainly in Engineering, Shipbuilding, or the production of Munitions of War, or of substances required for the production thereof, must include the words "No person resident more than ten miles away or already engaged on Government work will be engaged."

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NOTICE is Hereby Given, that an ORDINARY GENERAL MEETING of this Company will be held at the Company's Office, Finsbury House, Blomfield Street, London, E.C., on Wednesday, the 22nd day of November, 1916, at Twelve o'clock noon precisely: To receive the Directors' Report and the Accounts of the Company for the Year ended the 30th of June, 1916; to declare a Dividend; and to elect a Director and Auditors in the place of those retiring.
The TRANSFER BOOKS WILL BE CLOSED from the 7th to the 22nd of November, both days inclusive.
By order of the Board.
S. Rainer,
Secretary.
Finsbury House, Blomfield Street,
London, E.C., Nov. 1, 1916.

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